The University of Alberta
Printing Department
Edmonton, Alberta

THE UNIVERSITY OF ALBERTA

THE GEOGRAPHY OF THE FOREST PRODUCTS INDUSTRIES OF NORTHERN ALBERTA

BY

R. BRUCE MacLOCK

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF

MASTER OF ARTS

EDMONTON, ALBERTA

MAY, 1967

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled The Geography of the Forest Products Industries of Northern Alberta, submitted by R. Bruce MacLock in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

This study assesses the sawmilling activity in Northern Alberta and describes the technological aspects of the raw material flow. This is followed by a discussion of the minimum size of profitable independent lumber-producing units under present conditions.

Current Northern Alberta woods operations have been considerably affected by the rapidly changing technology of harvesting and transporting the raw material. As a result of larger more efficient machinery, particularly trucks, the forest products industry of Northern Alberta is beginning to centralize its milling operations (i.e. replacing the bush sawmills with one centralized sawmill).

The location of forest operations in Northern Alberta has been largely determined by the location of the more valuable timber stands, whose locations were in turn determined by the irregular topographic and edaphic conditions of the stands as well as by forest fires. In general, the location of the desirable western white spruce stands can be referred to as being scattered throughout Northern Alberta.

The location of sawmilling operations in Northern Alberta has been influenced by six factors: high overland log transportation costs, lack of wood waste markets, the presence of small producers, governmental forest administration policy, labour, and low timber stand density and small trees.

The location of planer mills is largely determined by the operator's market preference. If the operator wished to serve the extraregional market he located his planer mill alongside a railway.

Regarding the actual minimum economic size of an efficient, full-time one-man-owned-and-operated lumber producing mill, it was found that an annual production level of five million board feet divided the profitable from non-profitable operations. Operators who do not reach this level seem to make ends meet by taking on outside activities.

When a regionalization of sawmilling activity in Northern Alberta was attempted, using Derwent Whittlesey as a guideline, eight functional nodal regions of sawmilling were found and located.

The future of the forest products industry in Northern Alberta is dependent upon development of wood waste markets; in particular, pulp and paper mills. In every lumber producing region where a pulp and paper mill is built that is willing to buy wood waste for pulp chips, a change in the minimum economic size of lumber producing operations will occur. That is, the minimum economic size of an operation will range from approximately five million to fifteen to twenty million board feet annually.

ACKNOWLEDGMENTS

This study would not have been possible without the co-operation of the businessmen and mill owners of the study area. I would particularly like to thank the owners and managers of Western Construction and Lumber Company Limited, North Canadian Forest Industries and Weldwood of Canada, Limited.

Special thanks are due to the members of the Forest Administration Branch of the Alberta Provincial Department of Lands and Forests, in particular Mr. R. G. Loomis.

I wish to thank Professor O. F. G. Gitwell for his encouragement and constructive criticism in the preparation of the manuscript. Further, I wish to express my thanks to Mrs. Lois French for the thankless task of typing the final copy.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF PLATES

CHAPTER I

INTRODUCTION

Historical Development

Alberta's forest products industry has grown steadily since the first recorded timber sales in southwestern Alberta in 1880. At that time modest industries were launched to produce mine props and timbers, railway ties and some rough sawn and finished lumber, all for the local markets of southern and central Alberta.

The sparsely settled, less accessible, northern portion of the province provided very little market for lumber and timber, and hence, little impetus for the development of a commercial forest products industry. A few farmers who had settled on arable land in northern Alberta, set up small crude sawmills to provide themselves and their neighbours with lumber for their construction needs. The famous Sheridan Lawrence, often called the "Emperor of the Peace", hauled a small portable sawmill four hundred miles overland from Edmonton to remote Fort Vermilion during 1900 - 1901.[1] For many years this was the only sawmill in the northern Peace River country.

With the construction of railroads into the northern portion of the province during the first decades of the present century, many undeveloped, coniferous and mixed-wood stands of timber became within reach of markets. Large, centralized log conversion plants were constructed on sites where railroads and major rivers met.[2] The Western

---

1. Eugenie L. Myles, The Emperor of Peace River, The Institute of Applied Arts. Edmonton. 1965.

2. Log conversion plants - this refers to a sawmill or a sawmill-planer mill combination whether spatially integrated or not. See Glossary.

Construction Company sawmill was built in 1921, the year that the Grand Trunk Pacific Railway reached Whitecourt. Swanson Lumber Company built a similar mill at Chisholm Mills in 1925, shortly after the Edmonton, Dunvegan and British Columbia Railroad passed through this point. These two plants exemplify the early lumberman's concept of large scale centralized mills, so typical, for example, of the pre-1900 white pine industry found in Michigan and Minnesota. These two northern Alberta plants were sawmill-planer mill combinations handling logs that were floated down the Athabasca River from upstream forests. Logs were lead into catchment areas, sorted as to species and lifted out of the river into the conversion plant. Immediately before World War II both of these lumber producing operations were decentralized because loggers had depleted those timber stands that were located adjacent to the Athabasca River. Logging operations moved into the major interfluvial areas, away from the larger rivers. To overcome the need to haul heavy logs overland, portable bush sawmills were established on the logging show sites,[3] and have remained in this forest location for approximately thirty years.

World War II gave these industries an opportunity to expand on a spectacular scale with increasingly large amounts of finished lumber being shipped to eastern Canada and the eastern United States. Even greater opportunities for expansion occurred as a result of the post-war building boom and the consequent heightened demand for timber. The greatest expansion took place in the later post-war economic boom of the 1950's. More lumber producers or operators entered production

---

3. Logging show site. This phrase refers strictly to that area where the logs are being cut down and does not include the sawmill. See Glossary.

in the Northern Alberta area during this decade than in any preceding decade. The plywood mills of Edmonton and Grande Prairie were established during this period and the pulp mill at Hinton was built in 1956.

Two related factors are basic in accounting for this overall growth in the number of log conversion plants. The first factor was the expansion of construction activity in the growing manufacturing and urban agglomerations of North America, particularly the northeastern United States, assisted by the depletion of traditional United States timber supply regions and of the heavily used British Columbia timber resources. The second factor was the general lowering and standardization of freight rates for certain commodities after World War II. (See Table VIII). The resultant increased accessibility to the northeastern United States market allowed marginal timber production areas, such as Northern Alberta, to process and sell a larger quantity of forest products than was previously possible. Most of the Northern Alberta producers, large and small, are dependent on this market for their existence.[4] It is reasonable to assume that the producers are particularly vulnerable to the upheavals and declines in the market. These market oscillations may be induced by protective tariffs, or by economic recessions such as those of 1957 and 1960. During this four year period, many of the least viable lumber producers in Northern Alberta were eliminated.

The post-war expansion of lumber production in Northern Alberta was not, primarily, brought about through the addition of

---

4. Personal Communication. S. A. Robinson, Alberta Forest Products Association, Edmonton.

the many new small producers who entered into production at this time. In fact, the few older, more firmly established producers expanded their operations sufficiently to retain a major proportionate share of the total Alberta production. During the period, 1960-1965, six out of the forty-five producers in Northern Alberta accounted for over eighty per cent of the average annual timber harvest.[5]

A major problem has developed in the lumber industry of Northern Alberta since World War II. Since the late 1940's and the very early 1950's, there has been a large number of small mills and a small number of large mills. This phenomenon has persisted until the present as was noted by Mr. A. J. Hamilton at the Changing Frontier Conference held in Peace River during October 1965.

The problem of too many small mills is also found in the neighbouring province of Saskatchewan. As was shown in a report entitled Saskatchewan's Forests[6] and other more detailed reports,[7] Saskatchewan's

---

5. A.J. Hamilton, "Future Sawmill Development in Northern Alberta", Changing Frontier Conference, Edmonton: Northern Alberta Development Council, 1965.

6. Saskatchewan's Forests, Saskatchewan Department of Natural Resources, Regina: The Queen's Printer. 1955. Page 68-69.

7. J.M. Atkinson and M.N. Palley, Forest Resources of the Pasquia--Porcupine Area, Saskatchewan Department of Natural Resources, Regina: The Queen's Printer. 1952.

   Forest Resources of the Prince Albert Area of Saskatchewan, Saskatchewan Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer, 1953.

   Forest Resources of the Meadow Lake Area of Saskatchewan, Saskatchewan Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer. 1954.

   ForestResources of the Cumberland-Lake - Flin Flon Area of Saskatchewan, Saskatchewan Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer. 1955

   Forest Resources of the Buffalo Narrows-Beauval Area of Saskatchewan Saskatchewan Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer, 1956.

saw timber industry (which draws timber from a commercially valuable forest zone of 21,342 square miles) retains an important and undesirable heritage of the past. "In 1952-53, 608 mills were operating in the Saskatchewan Forest of which all but nine were producing less than a million feet of lumber annually."[8] Most of these were the less desirable portable mills. Eight mills were producing one to five million board, and one was producing more than five million board feet annually.

At the present time, according to the authors of the afore--mentioned report, Saskatchewan's forest products industries are in a transition stage, from the early stage of cut and get out, to one of long term management; and from a mainly saw timber economy to diversification. That is to say, the authors of the report, Saskatchewan's Forests, felt, at that time, that medium-sized mills (producing from one to five million foot board measure of lumber annually), not large mills, would be the best solution to the problem of using Saskatchewan's commecial forest resources most efficiently. Further, these medium--sized mills must be prepared to produjce a diverse range of forest products (for example, chipboard and poplar plywood) from a wide number of heretofore unused species (such as black spruce, jack pine and trembling aspen) These findings should be borne in mind during the examination of Northern Alberta's industry which follows.

---

8. Saskatchewan's Forests, Saskatchewan Department of Natural Resources, Regina: The Queen's Printer. 1955. Page 68.

Framework within which the study will be approached.

Professor W. G. Hardwick of the University of British Columbia outlined a classification of sawmilling in Western Canada that is based on location and economies of scale.[9] The basic proposal of the idea is that there exist three levels of minimum economic size in the lumber industry of Alberta and British Columbia. These three minimum economic sizes are each a function of their evolution through time but even more important is the type of forest that each draws upon.

Figure 1 illustrates the location of the three sawmilling regions. Vancouver is the functional center of sawmilling for the highest or third order sawmilling region as well as the functional center for all three regions in the two western provinces. Hardwick justified his choice of Vancouver on the basis that sawmilling, the major form of log conversion in the Vancouver area, is performed using the largest scale economies in Western Canada. Huge sawmill-planer mill plants are built at a functionally central location, which are invariably at tidewater because logs can be transported long distances by water at much less cost than is possible by land.[10] The industry is structured with a high degree of vertical and horizontal integration. Pulp and paper, lumber and plywood are frequently produced under one roof or in three plants owned by the same company. Log utilization levels are as high as is technically possible. These mills are designed

---

9. Personal Communication. Interview. May 1966.

10. W. G. Hardwick. The Geography of the Forest Industry of Coastal British Columbia. Occasional Paper No. 5, B.C. Association of Geographics. Vancouver.

SAWMILLING SCALE ECONOMY LEVELS IN ALBERTA AND BRITISH COLUMBIA

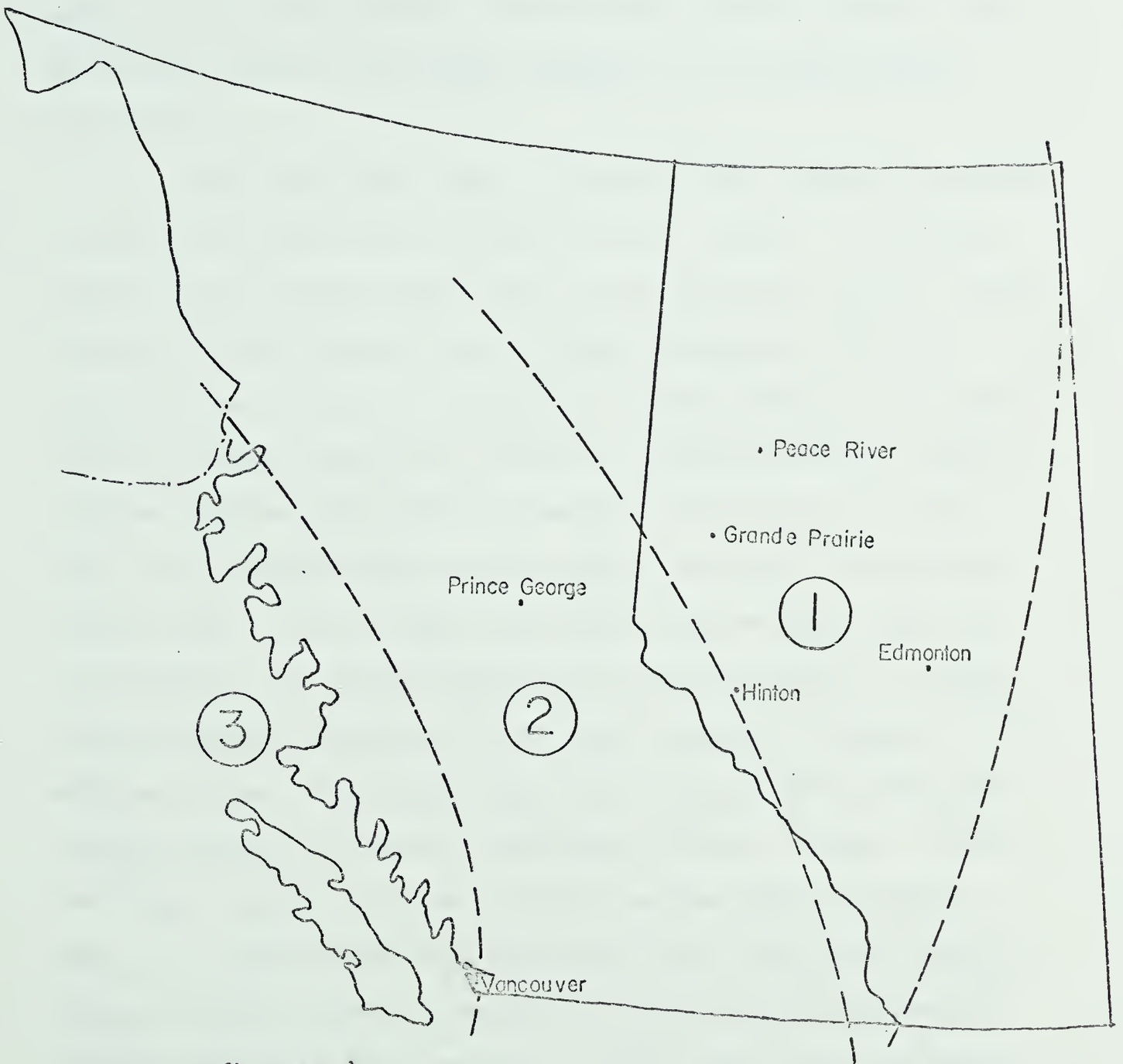


figure 1

First Order (1)

Second Order (2)

Third Order (3)

Scale in miles:

0 25 75 100 200 300 400

to handle very large cedar, hemlock or douglas fir logs. Logging is carried on with huge pieces of equipment, the logs being hauled to tide side locations using very large trucks. Logs are hauled to the distant log conversion plants in large rafts or on barges. The entire aspect of the coastal British Columbia forest products industry is one of virtually monstrous scale when compared to the Northern Alberta counterpart.

The second order region of log conversion activity is centered on the Prince George area of interior British Columbia. The dominant species used is western white spruce, as is the case in Northern Alberta. However, the log conversion and wood waste utilization methods are similar to the coastal British Columbia industry except for one aspect: the logs and wood waste are, of necessity, shipped overland. Hardwick inferred that the basic difference between a first order and second order log conversion region was the radical difference in the minimum economic size. In the second order region, pulp and paper mills act as outlets for the sawmill wood waste that would otherwise be burned. The wood chipper converts wood waste such as slabs and edgings into useable pulp chips. The purpose, large size, and cost of the wood waste chipper requires a permanent "functionally central" location. Because the chipper requires a central location, so then, does the sawmill, since it is sawmill waste that the chipper uses. The logical site to relocate the bush sawmill or sawmills is at the planer mill which is usually built along side a railroad. In this manner both wood waste, in the form of pulp chips, and finished lumber are shipped to their respective markets. This type of centralized log conversion plant, though not requiring as much capital as the plant found in the third order region, still needs a good deal because it has a large sawmill,

chipper and planer. Given markets for both finished lumber and pulp wood, a centralized plant of this type has proved to be the most profitable in interior B.C. The extra profits gained as a result of the sale of pulp chips helps to defray the added cost of shipping whole logs from forest to railside.

The first order log conversion region is one where there exists the least opportunity for the development of economies of large scale operations and where decentralized operations are most widely found. This phenomemn of decentralized milling operations is usually, though not always, caused mainly by a lack of wood waste markets and the high cost of overland log shipment. Before pulp and paper mills regarded sawmill waste as a good supply of pulpwood, lumber producing firms who drew their log supply from areas devoid of major streams, usually established a number of small portable bush sawmills. The purpose of these mills was to trim off all excess parts of the log, hence leaving rough sawn lumber. As a result of this decentralized sys--tem , as much fifty per cent of the log was burned as waste material. The desired, remaining fifty per cent was and is shipped overland by trucks to a centrally located planer mill which refines the lumber into a saleable product.

In recent years, as sawmill wood waste has come into acceptance by pulp and paper mills, lumber producers fortunate enough to be located close to pulp mills have profited, by being able to raise their log utilization levels from fifty to seventy-five per cent. It can be stated that these lumber producers were then operating in a more highly refined or sophisticated fashion than previously. However, thoselumber-producing areas that were without pulp mills or were without pulp mills that were willing to purchase wood waste, were not able to raise their log

utilization levels in like manner. Hence, the producers in these areas have tended to remain at a lower level of technological and organizational refinement.

For example, in the case of Northern Alberta, the nearest pulp mill has to date refused to buy wood waste in the form of wood chips, which has not aided the development of a wood waste market in Northern Alberta. For as long as this has been the status quo in Northern Alberta, there has been no reason to centralize milling operation for the sake of a wood chipping plant. The sole exception in Northern Alberta has been the North Canadian Forest Industries log conversion plant in Grande Prairie.[11] This company ships its wood chips to the parent company's pulp mill at Prince George, British Columbia. Barring this one exception, Northern Alberta's sawmilling industry can tentatively be described as a first order region of sawmilling activity.

The Purpose of the Study

The purpose of this study is to assess the sawmilling activity in Northern Alberta, and to describe the technological aspects of the raw material movement, using the framework provided by Hardwick's study. This will be followed by a discussion of the structure of the lumber industry in the area, with a view to identifying its spatial structure and finally, if possible, the minimum size of profitable independent lumber producing units under the present conditions. In doing this, the study will contribute to the analytic literature on the forest product industries of Western Canada, a field which has received relatively little attention in the past, although provincial agencies have recently begun to provide a cosiderable volume of basic data.* Indeed, without these data this study would not have been possible.

11. See Appendix A.

* See Footnote 7 above for some representative publications from Saskatchewan. The Albertan material will be discussed in later chapters as called for by the context of the study.

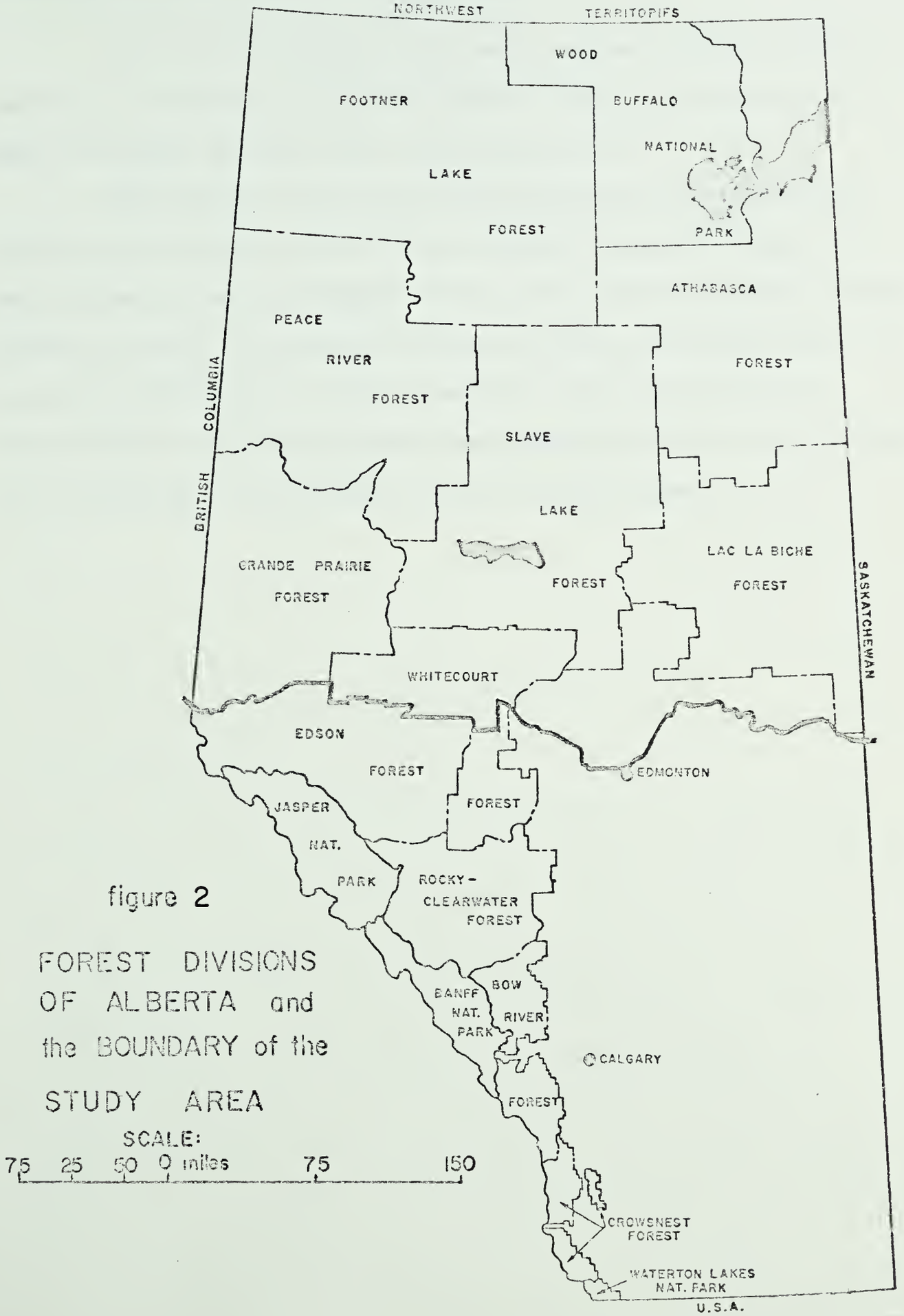


figure 2

FOREST DIVISIONS OF ALBERTA and the BOUNDARY of the STUDY AREA

SCALE:
75 25 50 0 miles 75 150

SOURCE: ALBERTA DEPARTMENT OF LANDS AND FORESTS, 1966

Boundary of the study area, Northern Alberta.

The southern boundary of the study area was selected partly on the basis of convenience, and partly because it was deemed necessary to separate Montane and Great Plains woods operations.

The boundary follows the Edson-Grande Prairie Forest Division boundary east from the British Columbia-Alberta provincial boundary as far as Alberta provincial Highway 43. From that point the boundary follows Highways 43 and 16 to Edmonton, and then the North Saskatchewan River to the Alberta-Saskatchewan provincial boundary. Part of the Whitecourt Forest Division is Excluded because it extends too far south to be considered, for the purposes of this study, as part of Northern Alberta.

CHAPTER II

THE RAW MATERIAL MOVEMENT

The contents of this chapter discuss the technical and geographical aspects of moving the raw material, logs, from the forest to the planer mills. This movement is divided into three stages, the woods operation, the sawmill operation and finally the planer mill operation. In order to clarify the description of the logging and sawmilling operations, a discussion of the contracting system will follow the logging operations section. The changing size of trucks and their capacities has had considerable effect on the location of the planer mills. Therefore a discussion of the changing technology of truck transport will follow the section on planer mill operations. The chapter closes with a discussion of the problems that beset the industry as a result of the physical environment.

The Woods Operation

Almost all logging shows, whether operated by a contractor or the timber licensee, a poor small operator or a rich large operator, were quite similar in method of operation. The key to the operation is the logging crew which normally consists of nine or ten labourers though as many as twelve may be found. Houg Construction of Joussard, for example, normally has nine workers in their sole logging show. A much larger producer, Western Construction of Whitecourt, uses an average ten to twelve workers at each of their seven logging shows. The logging crew used at a representative logging show is made up of the following individuals: one cutter or feller, two swampers or

delimbers, two skidding tractor operators, two arch truck operators, and two second drivers who also hook up the logging chains or cables behind the skidders and perform general helping duties.

The cutter or feller, equipped with a chain-saw cuts the trees down. The swampers work in close conjuction with the feller. They trim the branches from the fallen trees. In order to facilitate a systematic and unobstructed log collection system at the logging show site, skidding trails are often constructed on a rectangular grid system. These skidding trails are constructed parallel to one another with roughly one hundred yards separating them. Fellers can then cut the trees in such a way that they will always fall close to one of them.

The task of the skidding tractor operator is to hook the tree-length logs, small end first, to the rear mounted winch on the skidder, with the aid of a helper or swamper if necessary. (See Plate I). A scraping blade mounted on the front of the skidder and the rear-mounted winch are used to push or pull the small end of the log into a position where it can be hooked up to the winch on the skidder. (See Plate III). Logs are not skidded trunk end first because a collection of heavy trunks would be too much strain on the winch. It should be observed that the purpose of the skidder tractor is not to carry most of the weight of the log, but instead simply to drag it at slow speeds. A major problem faced by the skidders is that manoeuvring in the forest with the logs attached to the skidder tends to damage or destroy many of the smaller trees which are the future sawlogs or peeler logs. (See Plate II).

In the study area, there are three types of skidders in use:

Plate I. Crawler tractor skidder with operator and helpers. Note the blade for pushing logs and clearing the trail.

Plate II. A crawler skidder pulling a load of tree-length logs.

Plate III. Skidder tractor operator detaching logs from a winch.

Plate IV. A rubber-tired skidder.

a crawler-tractor skidder, a rubber-tired-tractor skidder and an arch-truck skidder. The crawler-tractor skidder is the most common type of tractor skidder in use in the study area in 1966. (See Plate I). A lighter, more flexible, more maneouverable tractor type skidder, equipped with four wheel drive and rubber tires, has been developed for work in low density, small-tree forests. (See Plate IV). These machines, hinged in the middle, are quite suitable for operating in severly dissected, wet terrain. They require a less extensive system of skidding trails than the heavier, awkward crawler type skidder tractors for two reasons: they can manoeuvre in thinned stands of timber without damaging the uncut trees, and being lighter they are less likely to get bogged down in soft areas. They also cost only half as much as a crawler tractor. The third type of skidder, the arch truck is designed to support heavy weights, and is essentially a truck equipped with a heavy duty rear axle and a heavy duty winch and boom device built on top of the rear axle. (See Plate V).

Once the skidder has collected enough logs, it drags its load to a log collection area, or more usually, the sawmill. The logs are then stacked in piles. (See Plates VI and VII). If the sawmill is more than one and a half to three miles away from the landing, logging trucks are used for log hauling.[1] If the sawmill is less than one and a half to three miles away, arch trucks are most commonly used. In

---

1. One and a half to three miles is considered as the critical or maximum economic distance for arch trucks skidding by two industry members. 1) Western Construction Lumber Ltd. 2) James MacLean. If an arch truck must go further it usually is incapable of hauling as many logs to the mill as the skidders are of hauling to the landing. Two skidders usually feed one arch truck.

Plate V. An arch-truck skidder.

Plate VI. Tree length logs stored adjacent to sawmill.

Plate VII. Logs and sawmill in background. Note unburned sawdust behind the mill.

Plate VIII. Fork-lift loader placing logs on a sloping platform. The logs then roll into the sawmill.

fact, the smaller producers and contractors will move their sawmills in an effort to continue using arch trucks. Arch trucks have the advantage of not requiring expensive loading and unloading machinery. The arch truck's large rear-mounted winch and boom device is designed to lift a considerable number of logs by the large end and half carry and half drag this load at a reasonable speed. Also, arch trucks do not require as good a road as a logging truck. However, arch trucks are most useful on level ground, because they have poor climbing ability when loaded. Because much of the logging activity in the study area is conducted on relatively level land, the arch truck skidder is the most common type of skidder in use.

If logging trucks are to be used, costly loading and unloading equipment is necessary. In the study area most operators attempted to develop their own types of improvised loaders rather than purchase manufactured equipment such as grapple or scoop loaders or the various boom-type loaders. As a result fork-lifts of all types are commonly employed in loading and unloading logs.

Contracting: Logging, Hauling and Sawmilling

Contract logging and sawmilling is an integral function in lumber and plywood production in Northern Alberta. Almost every one of the lumber producers in the study area use contractors to aid them in the first stages of their production system and in the hauling of logs, and of rough-sawn and finished lumber.

The main responsibility of the contractor is to fell the tree, delimb it, skid it to a "landing" or collection area, load it onto a logging truck and deliver it to the sawmill whether it is in the forest

or adjacent to the planer mill. The contractor often sub-contracts the actual tree felling job to one or two men and then hires the swampers or delimbers, the skidder operators and helpers as well as truck drivers. The contractors and sub-contractors must at least provide their own skidding equipment and trucks. Frequently, the contractor owns his own sawmilling equipment. All contract work, whether it is contract logging or contract sawmilling or both, is undertaken on a piece work basis per one thousand foot board measure.

Contractors are not responsible for payment of provincial stumpage fees, ground rent, holding charges, and fire protection charges, nor are they responsible for the construction and maintenance of logging roads.[1A] These are the timber licensee's responsibility. The contractor is, however, responsible for the construction of his own skidding trails. It is interesting to note that many of the contractors who undertake contract logging during the winter are also road construction contractors in the summer.[2] This gives them year round employment. Their road building equipment is very useful in constructing their own skidding trails or constructing logging roads for the timber licensee. Some particular pieces of equipment such as earth movers or crawler tractors are quite versatile: they are used to skid logs as well as build roads.

Despite the fact that the contract system interrupts the vertical integration or linkage of the lumber producing "chain", it does not, however, detract from the efficiency of this northern Alberta

---

1A. See Page , Chapter III for information regarding taxes et al.
2. Pers. Comm., Mr. Zutz, Production Manager, Western Construction Company, Whitecourt.

industry.[3] The contracting system tends to simplify the administrative tasks of the lumber producer but does not alleviate the lumber producer's financial burden. The Northern Alberta lumber producer frequently owns some of the logging and most of the sawmilling equipment that a contractor requires in order to deliver rough sawn lumber to the planer mill. The contractors in the study area are usually equipped with crawler tractors and trucks for skidding and hauling. It is the feeling of the industry that these pieces of equipment are best owned and operated by the contractors.[4] If a contractor owns such equipment he usually tends to use it less abusively, in an attempt to reduce the rate of depreciation, than he does if he is operating equipment belonging to an employer.

It is interesting to note that contractors have in the past tended to underestimate the depreciation costs on their machinery whereas the responsible lumber producers have tended to assess depreciation costs more realistically.[5] In other words lumber producers employ a higher turnover rate in equipment which would raise their logging costs over the contractor's costs. It can be seen that the lumber producer usually gains at the contractor's expense.

Another way in which the contracting system tends to favor the lumber producer is found in the method of payment. It is the experience of the lumber industry that hiring the necessary loggers

---

3. Pers. Comm. Mr. A. J. Hamilton, Managing Director, Swanson Lumber Co. Ltd.

4. Ibid.

5. Ibid.

and sawmillers on a salary or hourly basis, in the bush, instead of contracting them, frequently leads to lower production levels.[6] In other words, the contractor acts as an on-the-spot job supervisor who is anxious to assure the attainment of production levels high enough to fulfill his commitment and still make a profit.

The Sawmill Operation

At the sawmill, the tree-length logs (often forty feet long) are dumped at a "bucking and sorting" yard. Here the logs are sorted as to species and cut up or "bucked" into ten to twenty foot lengths that are suitable for the sawmill. British Columbia producers tend to use mill ponds as storage and sorting areas. When a logging or arch truck arrives at the mill, the logs are unloaded directly into the mill pond, which is often no more than a large dugout filled with water. This method reduces the amount of equipment and labour needed for yard handling. Northern Alberta producers cannot use mill ponds, because they do their sawmilling in the winter.

With the use of a fork-lift or scoop loaders, logs are taken from the storage piles and dropped onto a tilted or sloped platform that allows the logs to roll slowly into the mill. Individually, the logs are gripped in a vice-like pneumatic or electrically powered log carriage.

Most of the Northern Alberta sawmills are not equipped with the most recently developed sawmilling equipment, which has been mainly designed for large mills. Instead they use the traditional revolving

---

6. Ibid.

circular saw with another circular head rig saw built directly above the main saw. (See Plates XI and XII). The top saw is operated when a very large log is to be sawn. (See Plate X).

The sawyer, through the use of the log carriage, can move the logs back and forth quite rapidly, passing it through the saw blade as often as he sees fit.[7] The sawyer is frequently the key determinant in the success or failure of a small lumber producing operation. A good sawyer will assess every log before he saws it, and decide immediately how it can be sawn in order to obtain the highest possible log utilization level. (See Plate XIV). While the small producers must attempt to get as much good lumber as possible out of each log, the larger producer tends to try to saw as many logs as possible. Examples of the latter are the Swanson Lumber sawmill at Fort Chipewyan and the smaller North Canadian Forest Industries sawmill at Grande Prairie. These two sawmills, valued at approximately one million dollars each, are highly mechanized, thus reducing labour requirements. They use gang saws which are designed to process a whole log at high speed (i.e. one hundred and thirty-two feet a minute).[8]

After the log has been sawn up into a series of two inch thick cants or slabs, another type of saw, called an edger (similar to the gang saw shown in Plate XIII), is used to cut the two inch cants (the dimensions of which can range up to three feet wide) into planks or studs of suitable dimension: four, six, eight, ten and twelve inch wide planks are common.[9] Larger types of edgers called "bull edgers" are

---

7. Sawyer: See Glossary.

8. Gang Saws: See Glossary.

9. Studs: See Glossary.

Plate IX. A front-end grapple-loader.

Plate X. Sawyer and helper. Note the headrig top saw which is used when very large logs are sawn. The log in the picture is on the second sweep through the saw.

Plate XI. An uncovered sawmill at Hines Creek. Note conveyor system.

Plate XII. Sawblade and cable operated log carriage system to the left.

Plate XIII. Gang saw.

Plate XIV. Cants and rough sawn planks ready for dry-piling.

rarely used in the study area because of the small size of the trees being processed. Immediately after being processed by the edger, the planks are cut into suitable lengths by "trim saws".[10]

Waste material, such as slabs, edgings and trimmings which account for thirty per cent of the log, and sawdust which accounts for another twenty per cent are carried away to a waste material burner, via small conveyor belts and a fan driven vaccuum system.[11] Many of the smaller and some medium sized producers do not use burners. Instead they dump their waste materials to form large piles which are burned later. This method of burning is permitted only during the winter when the forest fire hazard is lowest.

Where bush sawmills are used, this writer found that contractors and producers ship their rough sawn lumber from the sawmill to the planer mill on the same day or the day after it was sawn. At the planer mill it is piled in "dry-pile areas" where it is left until the summer planing season. (See Plate XV). Only one kiln dryer is employed in the study area, at the Swanson Lumber planer mill at High Level. This mill realizes two advantages as a result of the kiln. The main benefit gained is that the problem of having large sums of capital "immobilized" in millions of board feet of frozen or wet rough sawn lumber stored in a dry-pile yard, is eliminated.[12] The kiln enables the continual movement of lumber from forest to market. Next, a thermostatically controlled kiln, held at 150° fahrenheit for sixty

---

10. Trim Saws: See Glossary.

11. Personal Communication: G. A. Patterson, N.C.F.I., Grande Prairie.

12. Personal Communication: S. A. Robinson, A.F.P.A., Edmonton.

Plate XV. Dry-pile yard.

Plate XVI. A light weight hydraulic loader attachment on the rear end of a farm tractor.

Plate XVII. A very small planer operation at Enilda.

Plate XVIII. A cramped planer mill operation at High Prairie showing men loading boxcar with finished lumber.

hours, tends to dry lumber more evenly than the dry pile system. Kiln dried lumber is valued more highly by the potential customer because even drying prevents warping at a later date.

An interesting feature of the kiln is the use of planer shavings as the heat source. While the planer is running it is pumping dry wood shavings into a large storage bin adjacent to the kiln furnace. If the storage bin is full, the excess shavings are burned as they normally would be, in the planer shaving-burner.

The function of the planer mill is to further refine the rough sawn lumber. At the sawmill, the rough sawn lumber is not milled to its final, precise dimensions. Furthermore, it is left with a rough surface caused by the sawblade.

The Planer Operation

The planing machine applies the smooth or polished surface of all finished lumber. (See Plate XXII). Four revolving steel drums (eight inches in diameter and up to twelve or fourteen inches long) are fitted with six, eight or ten cutting blades or planing knives. These revolving drums and their planing knives are adjusted to whatever dimension the operator desires. Rough sawn lumber is then fed into this machine and emerges with a smooth, precision milled surface and exact, standard dimensions. An attempt is made to prevent much wastage. For example, rough sawn lumber cants of three inch thickness, that may be a result of an inexpert sawyer, are not fed into a planer that has been set to shave the lumber to a thickness of the standard one and five-eights inches. The three inch cant is resawn into a two inch plank and a one inch board. As was previously noted, the average cant

Plate XIX. A band resaw.

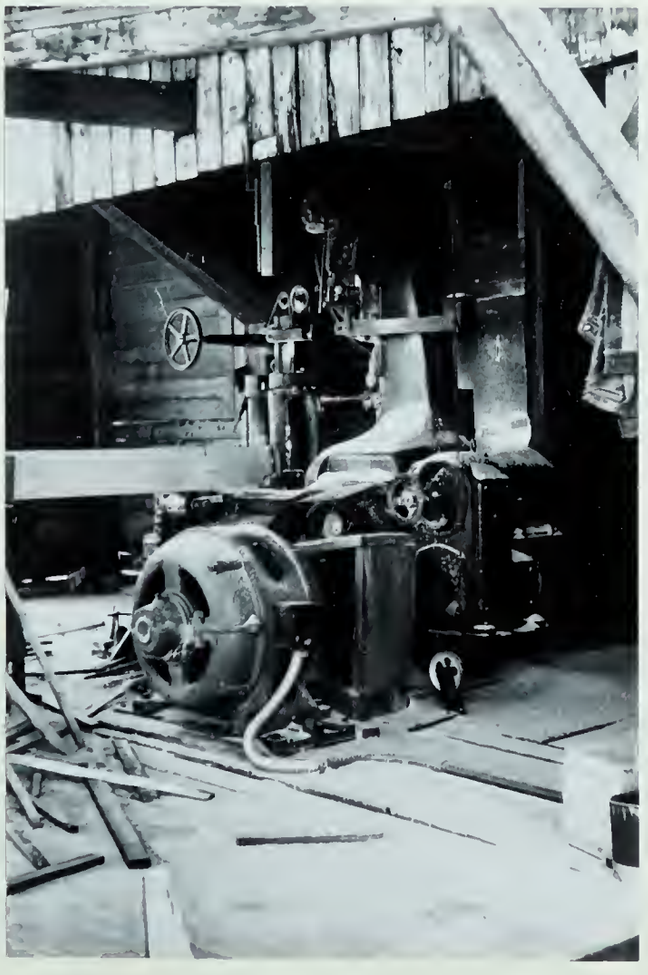


Plate XX. Electric motor and and band resaw. Note two-inch plank being resawn into two one-inch boards.

thickness is two inches. Quite frequently, an operator may wish to sell a quantity of one inch thick shelving or siding material. As a result, almost every planer mill in the study area is equipped with a"band resaw",[13] (see Plate XIX), which is located in front of the planer machine. This allows the operator to saw the two inch planks or cants into two one inch boards (see Plate XXI): if he prefers not to produce one inch boards, he merely bypasses the resaw. For resawing the band saw is preferred to the circular saw because it cuts with a narrower kerf,[14] which allows more room for error if the cant was originally sawn to a width of less than two inches.

Only two of the lumber producers in the study area are concentrating their efforts on producing one inch boards. These are the Western Construction Lumber Ltd. at Whitecourt, and the Imperial Lumber Co. mill at Grande Prairie. As a result these two mills emphasize very careful grading systems and must hire skilled band saw operators. This type of skilled sawyer is required to change his band saw blade every half shift (approximately four or four and a half hours) because the saw teeth require frequent sharpening and the band itself requires re-tempering.

Many of the remaining producers cut planks or cants into one inch boards whenever they have accumulated a large enough number of high grade cants to warrant operation of the band resaw. The planer shavings from the planer are usually burned as waste. As was mentioned previously, however, one planer mill in the study area stored a quantity

---

13. Band resaw. See Glossary.

14. Kerf. See Glossary.

Plate XXI. Rough sawn lumber being fed into band resaw.

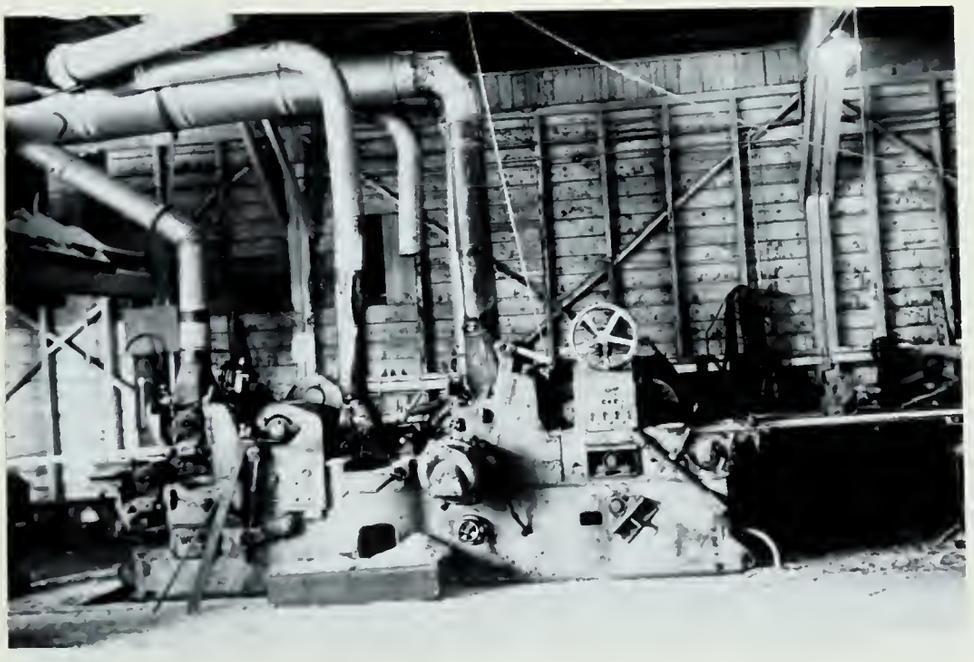


Plate XXII. A planer with pipes carrying shavings away to the burner.

Plate XXIII. Boards being fed into the planer after the resaw.

Plate XXIV. Loaded pulp-chip cars at Grande Prairie.

of shavings for use as fuel in a drying kiln.

After the planing process, small circular precision trim saws are used to trim the ends of the studs, planks, or boards to an almost perfect ninety degree angle. Some mills wax the ends of all finished lumber in order to enhance the appearance of the product as well as to prevent end splitting in the event of drying in shipment. Others, besides waxing the ends, pack their lumber into prescribed bundles, wrapped in heavy paper, in order to further enhance their product. The lumber, marked with a grade stamp, is then sent to market.

A most interesting feature of the sawmills and planer mills in the study area is found in the methods of powering the various pieces of equipment used in conversion and refinement. Because most of the sawmills in Northern Alberta are remote bush mills, there is little possibility of using electric motors on each individual machine as shown in Plate XX. As a result, most of the operators and contractors use diesel motors to drive an often complex array of long drive belts and pulleys which in turn drive the log milling equipment. If an operator or contractor cannot gain access to private or public electricity sources without considerable expense, he is not likely to attempt generating his own power using diesel-driven generators or even steam power generators because the generator and numerous electric motors, though less complicated, are more expensive to purchase than the dangerous, complicated and hard-to-maintain, breakage prone, belts and pulleys.

Though most of the planer mills are located along rail lines and in towns, electric power is not always available or available at an economic price. Special power rates for industrial consumers came into

effect during the summer of 1966 in the High Prairie area only as a result of Provincial Government pressure exerted on the private utility companies.[15] Before 1966, for operators like Gordon Buchanan (Buchanan Lumber Co., High Prairie) it was too costly to use electricity as the sole source of powering the planer mill. A larger mill than Buchanan's, the Western Construction planer mill at Whitecourt, for example uses $1600 worth of electricity monthly. Western Construction felt that, though this was a considerable expense, it was justifiable on the basis of a high degree of efficiency.

The Changing Technology of Truck Transport

Truck size and hauling capacity have influenced the location of planer mills in the past. For example, Mikkelsen Brothers Lumber of Athabasca originally located their planer mill approximately half way between Athabasca and their Calling Lake sawmill. This was done primarily because of the small capacity of the trucks available before the early 1950s. It was only after this period that Mr. Joe Mikkelsen considered it economically feasible to haul rough-sawn lumber the entire sixty miles to the railhead at Athabasca, at which time he re-located.

The problem centered around the fact that the small trucks, which were all that Mikkelsen or his hauling contractor could afford at that time, were not capable of hauling enough wet rough-sawn lumber the full distance to Athabasca to consider the venture profitable. Mikkelsen could only afford to have the trucks haul the wet rough-sawn

---

15. Pers. Comm., Gordon Buchanan, owner Buchanan Lumber Co., High Prairie.

Plate XXV. Poplar and spruce logs at Kinuso ready for shipment by rail to an Edmonton plywood mill.

Plate XXVI. Another method of shipping poplar peeler-grade logs.

lumber thirty miles. Once the wet rough-sawn lumber was dried and planed, which would lower its weight per thousand board feet from three thousand to eighteen hundred pounds, the trucks would be loaded again, but with a more valuable load and sent to Athabasca. The costs of loading and unloading twice were overcome by the money saved in hauling finished lumber for half the distance from forest to railhead. Another factor involved was the nature of the road to Calling Lake. This was improved during the early 1950s to the point where a heavily loaded truck (i.e. twenty to thirty-five tons) could be accommodated legally.

In recent years, manufacturers have been building much larger, and more efficient diesel and gasoline engined trucks which have also proved to be more durable. This has been clearly a response to the demand on the part of potential users. Lumber producers, contractors and trucking lines alike have profited from the reduced unit operating costs of the larger equipment. It should also be noted that the large trucks of the type now normally used were available in the early 1950s, but were far more expensive at that time. They cost less now, presumably because of the changes in the technology of production.

The foregoing discussion implies that rough-sawn lumber can now be hauled further, economically, than was formerly possible. However, it further implies that tree length logs can feasibly be hauled from the forest to a integrated sawmill-planer mill. By way of comparison, some of the coastal British Columbia logging trucks are hauling one hundred ton payloads; fifty tons on the double axle truck and fifty tons on a separate trailer. However, these heavy weights are being carried on privately owned logging roads, In Alberta, most hard

surfaced highways have thirty-five ton loading restrictions. Despite this restriction, a sixty thousand pound load of rough-sawn lumber or logs is a much greater amount than trucks or highways in the study area could accommodate in the early 1950s.

The Physical Environment

As has been seen in the foregoing sections the physical environment of Northern Alberta presents the lumber industry with a number of problems. The industry has, as a result, had to divide the yearly operation up into four distinct phases as shown in Table I.

Table I BREAKDOWN OF A YEAR'S OPERATION

December, January, February, March	4 months	=	Logging and Sawmilling
April, May	2 months	=	Rough-Sawn Lumber - Drying Period
June, July, August, September, October	5 months	=	Planing Rough-Sawn Lumber
November	1 month	=	Layover Period

Logging and Physical Geography

Logging activity in much of Northern Alberta is limited to the coldest months of the winter season, that is, the one hundred days from December 15 to March 30. This operational restriction is caused by the widespread occurrence of bogs and muskegs. (See Figure 3). Logging in the Swan Hills and upper Smoky River region can operate on

a year round basis, except in the wettest summers. Summer temperatures in other parts of the study area soften the ground surface to such an extent that almost no types of forest harvesting machinery, even the light-weight rubber tired vehicles can manoeuvre without sinking in or tipping over.

Extended periods of low winter temperatures and heavy snowfall are common and hamper winter logging operations in the study area. (See Figures 4 and 5). For example, skidding logs from the logging show site to the sawmill can be difficult in deep drifted snow. (See TableII). As will be seen in ChapterIII, such working conditions often result in a shortage of labour at the logging show site.

Sawmills and Physical Geography

Once the log has been converted to rough-sawn lumber at the bush sawmill it is stacked in piles in a yard adjacent to the sawmill, and made ready for immediate movement from the forest location in order to "beat" the spring thaw period. Otherwise, it remains in the bush until the following winter. Even an empty "low-boy" tractor-trailer hauling unit,[16] for example, is far too heavy to be safely used in the summer on what is normally a winterbush road.

Again cold temperatures can hamper this aspect of lumber processing. Due to the fact that most of the bush sawmills are unheated, working in the sawmill can be uncomfortable during the frequent cold spells. Heavy snowfalls also hamper yard activities.

Most lumber producers and contractors saw their logs during the winter months, which gives rise to the problem of sawing frozen logs. Two different types of saws can be used that have their own

16. Low-boy. See Plate XXVI and see Glossary.

characteristics:

(1) circular saws that cut the log leaving a wide (3/8 inch to 1/2 inch) kerf or saw cut. Sawdust can account for as much as twenty per cent of the log with this type of saw. However, circular saws require little maintenance such as sharpening.

(2) band saws that cut a very narrow kerf (1/16 inch to 3/32 inch) but require considerable maintenance such as tempering and sharpening.

Circular saws are more suitable for cutting frozen, moisture-laden logs because, unlike band saws, they do not 'bind' or jam. On the other hand band saws do not waste as much of the log and so could raise the margin of profit.

Table II

SNOWFALL IN INCHES - SEASONAL DISTRIBUTION FOR POINTS IN NORTHERN ALBERTA

Average	Beaverlodge	High Prairie	Fairview
August	0.0	0.1	0.0
September	2.9	1.4	4.7
October	5.1	4.6	7.5
Previous Fall (non-cumulative)	---- 8.0	---- 6.1	---- 12.2
November	9.9	8.5	13.0
December	11.9	9.3	12.4
January	13.7	9.7	16.4
February	9.0	5.7	9.8
March	11.4	9.4	11.1
Winter Fall	----55.9	----42.6	----- 62.7
April	5.7	4.7	8.5
May	2.3	0.5	0.4
June	1.0	0.0	0.2
July	0.0	0.0	0.0
Total	72.9	53.9	84.0

Source: Research Council of Alberta.

Planer Mills and Physical Geography

Good lumber market conditions prevail during the months of February and March, thus tempting some producers to "plane" their rough-sawn lumber while it is still frozen and undried. In order to procure the best prices for finished lumber it must be "dry"; that is to say, the natural moisture content of approximately twenty-four to twenty-six per cent must be lowered to fourteen or fifteen per cent. This requires either a kiln dryer or six to eight weeks of relatively dry weather with temperatures above the freezing point. Since the mean monthly temperatures in the study area during February and March are normally below thirty-two degrees fahrenheit, the alternatives are:

(1) either the operator builds a kiln and dries his rough-sawn lumber, or

(2) sends heavy frozen finished lumber to the customer at increased transport costs and decreased profit, or

(3) decides to plane his rough-sawn lumber during the summer.

Most producers preferred the latter alternative.

The time factor presents an additional problem because of the necessity of logging in the winter. One of the larger lumber producers in the study area, North Canadian Forest Industries, contended that it was quite difficult to procure a large enough log supply in the 100 operating days of winter to satisfy the demand of operating the planer mill for the 150 "planing days" of the year. On the other hand, Imperial Lumber and Swanson Lumber , and most of the smaller producers have little difficulty in procuring their log supply requirements. The reason for this may possibly be the fact that North Canadian is centralized: that is the difference is not so much a matter of size, but one of centralization as opposed to decentralization. In order for all producers to procure and saw the necessary number of logs, it is necessary to employ a larger labour force for the winter operation than is

needed during the summer. Most operators, however, manage to use the same labourers all year round by moving them from planer mill to sawmill in winter and back again in summer. These labourers must be capable of operating both a sawmill and a planer mill. The additional winter labour supply consists of tree fellers, swampers, catskinners and helpers, whether hired directly or contracted, who harvest the log and move it to the sawmill. The difficult problem of procuring the seasonal labour supply is partly alleviated by the large number of logging contractors. This system also has the advantage that the lumber producer does not have to purchase as much if any of the necessary capital equipment involved in the logging operation.

CHAPTER III

THE LOCATION OF FOREST OPERATIONS

The contents of this chapter will discuss the location and volume of the more valuable timber stands in Northern Alberta. This will be followed by a discussion of the problem of allowable annual cut versus depletion and the Provincial Government's forest management policy. Further it will deal with the actual location of harvesting activity in Northern Alberta, plus a few remarks on the locational factors of bush sawmills, planer mills and plywood mills. Finally, the chapter will conclude with summary discussion of the direction of the raw material movement, and the location of the central places or focii toward which the raw material flows.

Location and Volume of the Forest Resource

The most valuable stands of marketable timber in Northern Alberta tend to grow in separate and scattered areas. The climatic factors can hardly account for this as they tend to form regular patterns in the region (see Figures 4 & 5). The topographic and edaphic conditions of the stands, on the other hand, tend to be quite variable (see Figure 3) and this together with the occurrence of major fires has probably been the prime determinant of the pattern. A limited amount of literature has been published on site conditions in scattered areas within the study area.[1] The most comprehensive description of the vegetative cover in

---

1. E.H. Moss. Collected Papers on the Vegetation of Northwestern Alberta. National Research Council, Ottawa. 1952-1953

   R. J. E. Brown. Permafrost Investigations on the Mackenzie Highway In Alberta and Mackenzie District, N.W.T. National Research Council, Technical Paper 175, Ottawa. 1964.

   W. Odynsky, A. Wynnyk and J.D. Newton. Soil Survey of the High Prairie and McLennan Sheets. Report No. 17, Alberta Soil Survey. Research Council of Alberta. Edmonton. 1952.

   W. Odynsky, A. Wynnyk and J.D. Newton. Soil Survey of the Grande Prairie and Sturgeon Lake Sheets. Report No. 18, Alberta Soil Survey. Research Council of Alberta. Edmonton. 1956.

Alberta has been prepared through the efforts of the Alberta Forest Inventory culminating in a "Forest Classification Map" and an accompanying booklet.

Table III shows forest cover type by Forest Division in acres. Table IV indicates wood volumes by Forest Division and shows sawlog volumes in board feet, with other volumes in cords. Table V lists average volumes per acre in cubic feet by component species. The last table focuses on several important factors of volume distribution. The average volume of timber per acre in the northern Peace River

Table III AREAS BY COVER TYPES
Thousands of Acres

Division	Coniferous[1]	Mixedwood[2]	Deciduous[3]	Total
Grande Prairie	1,419	931	1,328	3,678
Lac La Biche	3,728	3,188	1,622	8,538
Peace River	2,160	4,155	4,567	10,882
Slave Lake	1,115	2,567	1,708	5,390
Whitecourt	1,341	1,077	723	3,141
Metis Colonies	22	124	329	475
Totals	9,785	12,042	10,277	32,104

Per Cent

1. Less than 25% Deciduous content by volume.
2. Coniferous and Deciduous content 25% to 75% each by volume.
3. Less than 25% Coniferous content by volume.

Source: Alberta. Department of Lands and Forests, Alberta Forest Inventory, 1961, Edmonton.

Forest Division and northern Lac La Biche Forest Division (areas now designated as Footner Lake Forest Division and Athabasca Forest Division

respectively) is significantly lower than in other Divisions. "This is not a reflection of poor site productivity but of frequent fires and lower average age of trees."[2] The average volume per acre of white spruce is quite consistent throughout the study area, showing that it is well distributed. Pine, however, has much higher values per acre in the foothill areas of Grande Prairie and Whitecourt (Swan Hills region) Forest Divisions. The highest average volumes per acre are found in the Whitecourt and Slave Lake Forest Divisions.

Allowable Annual Cut vs. Depletion

The gross allowable cut as calculated by the Alberta Forest Inventory and shown in Table VI far exceeds the present depletion by cutting. The latter is shown in Table VII and Figure 6.

However, the total allowable annual cut of over 1,075 million cubic feet has been reduced by 25 to 50 per cent through the institution of the "quota system" in 1966. This is designed to allow for depletion by decay and annual fire loss, as well as retention of trees for watershed protection and erosion control. Other important factors which reduce the volume actually available are timber that is physically inaccessible or is economically non-marketable because of small size and low volume per acre, and finally poor provincial forest management policies.

Government Forest Management Policy

A policy of sustained yield forest management is to be implemented by legislation which came into full effect in Alberta in

---

2. The Alberta Forest Inventory. Alberta Dept. of Lands & Forests. Forest Surveys Branch. November 1961. Edmonton. P. 29.

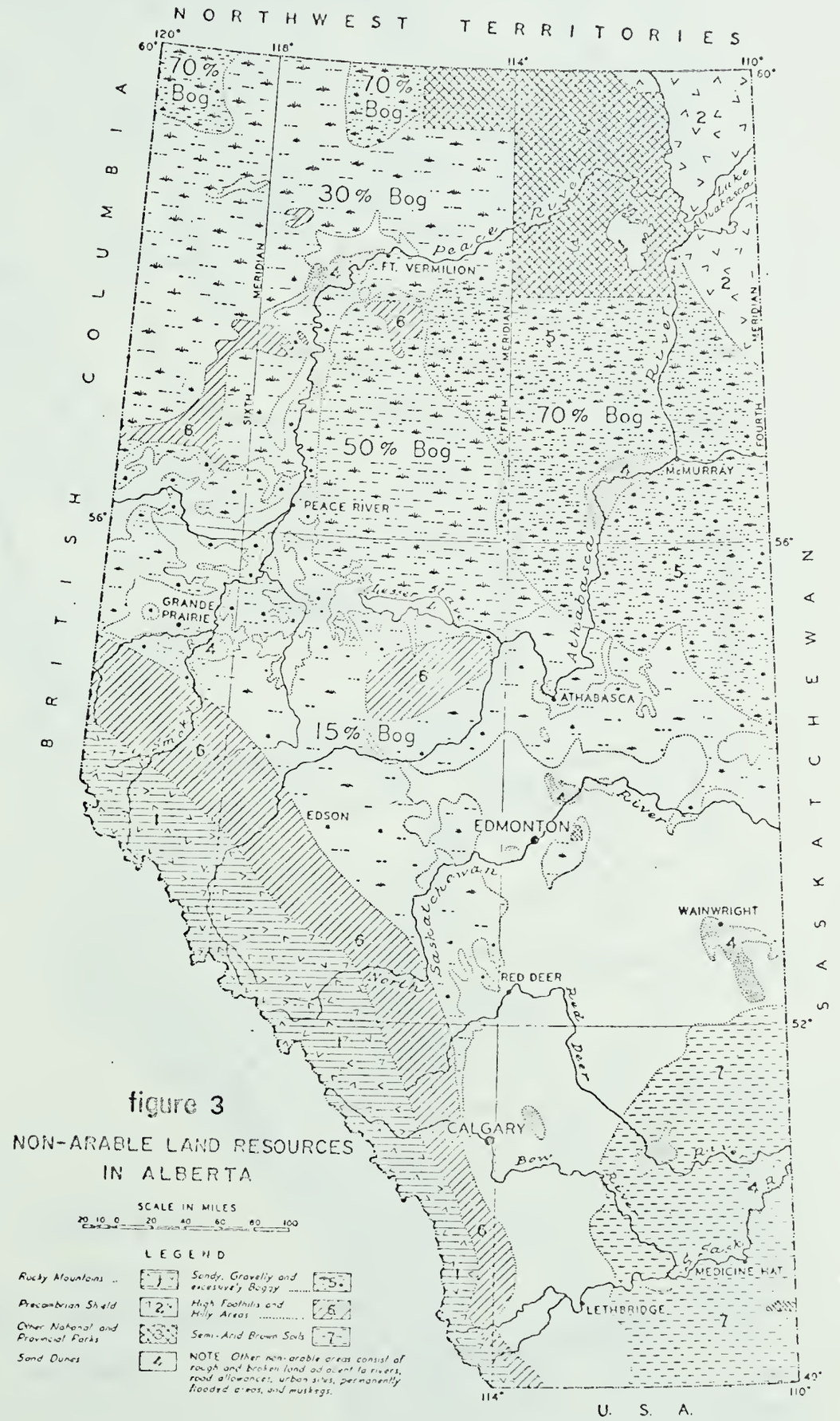


figure 3

NON-ARABLE LAND RESOURCES IN ALBERTA

Arranged by W. Earl Bowser, Canada Experimental Farms Service, 1959

SOURCE: RESEARCH COUNCIL OF ALBERTA

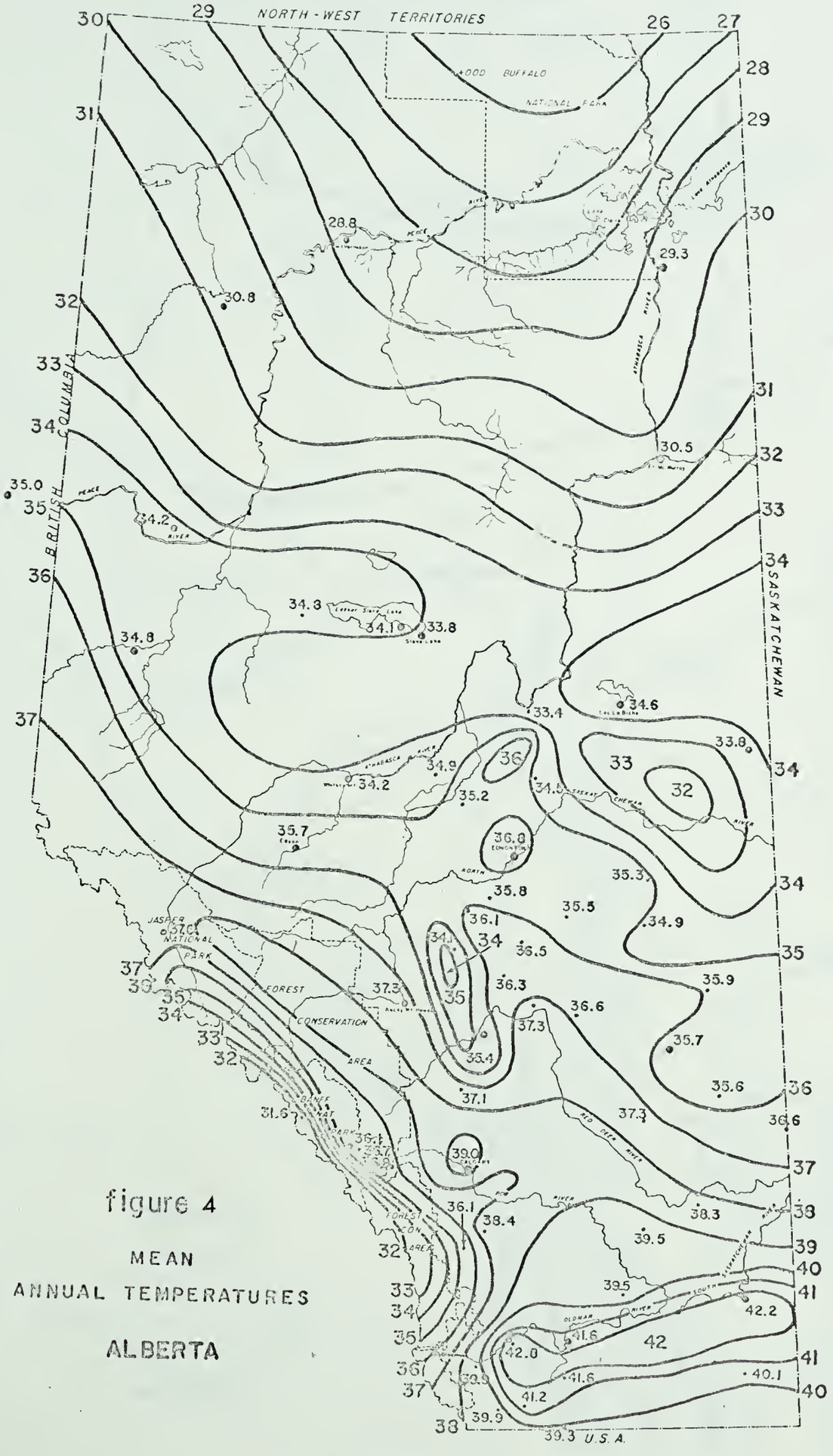


figure 4

MEAN

ANNUAL TEMPERATURES

ALBERTA

SOURCE: ALBERTA DEPARTMENT OF LANDS and FORESTS, 1966

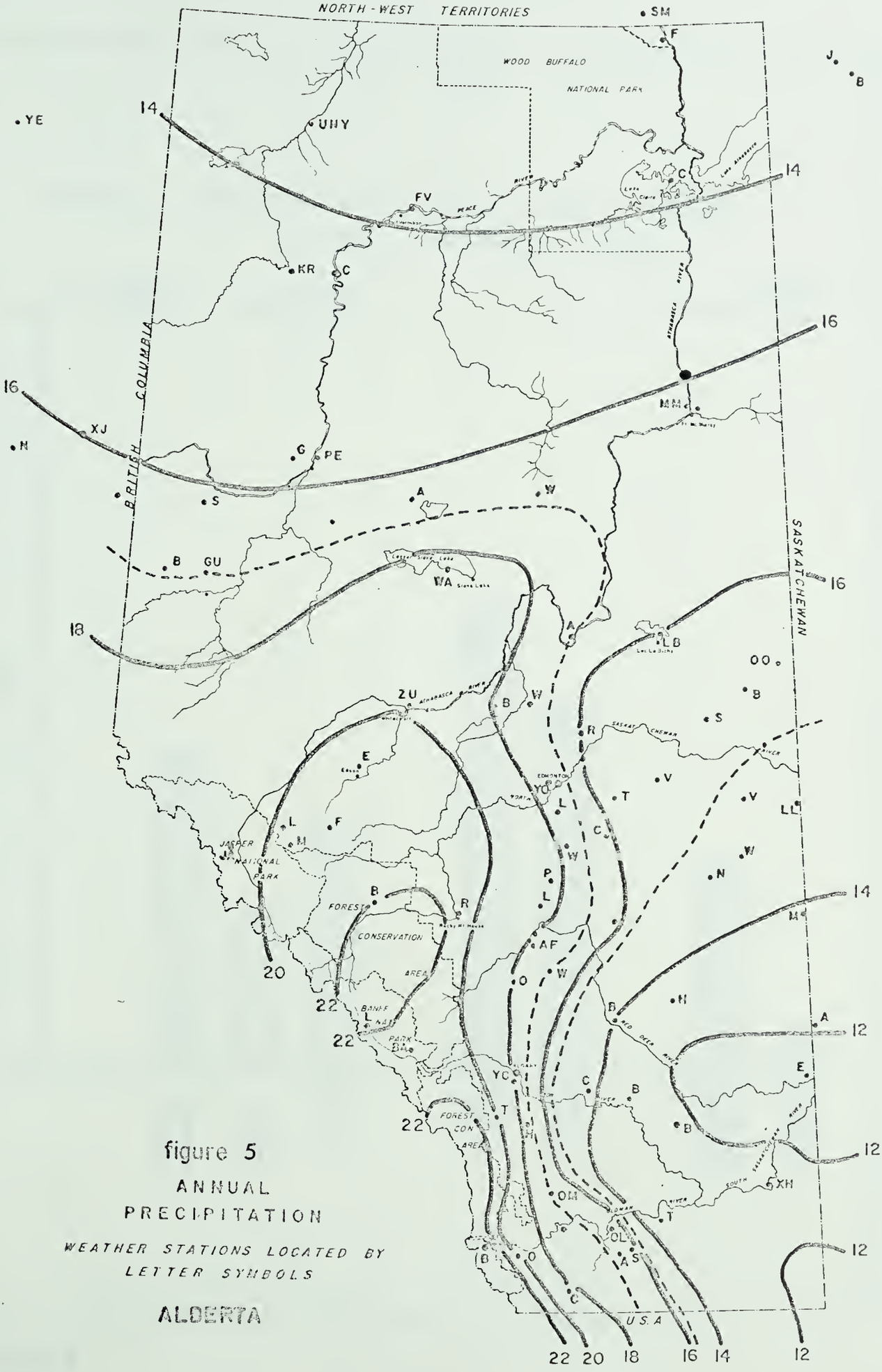


figure 5

ANNUAL PRECIPITATION

WEATHER STATIONS LOCATED BY LETTER SYMBOLS

ALBERTA

SOURCE: ALBERTA DEPARTMENT OF LANDS and FORESTS, 1966

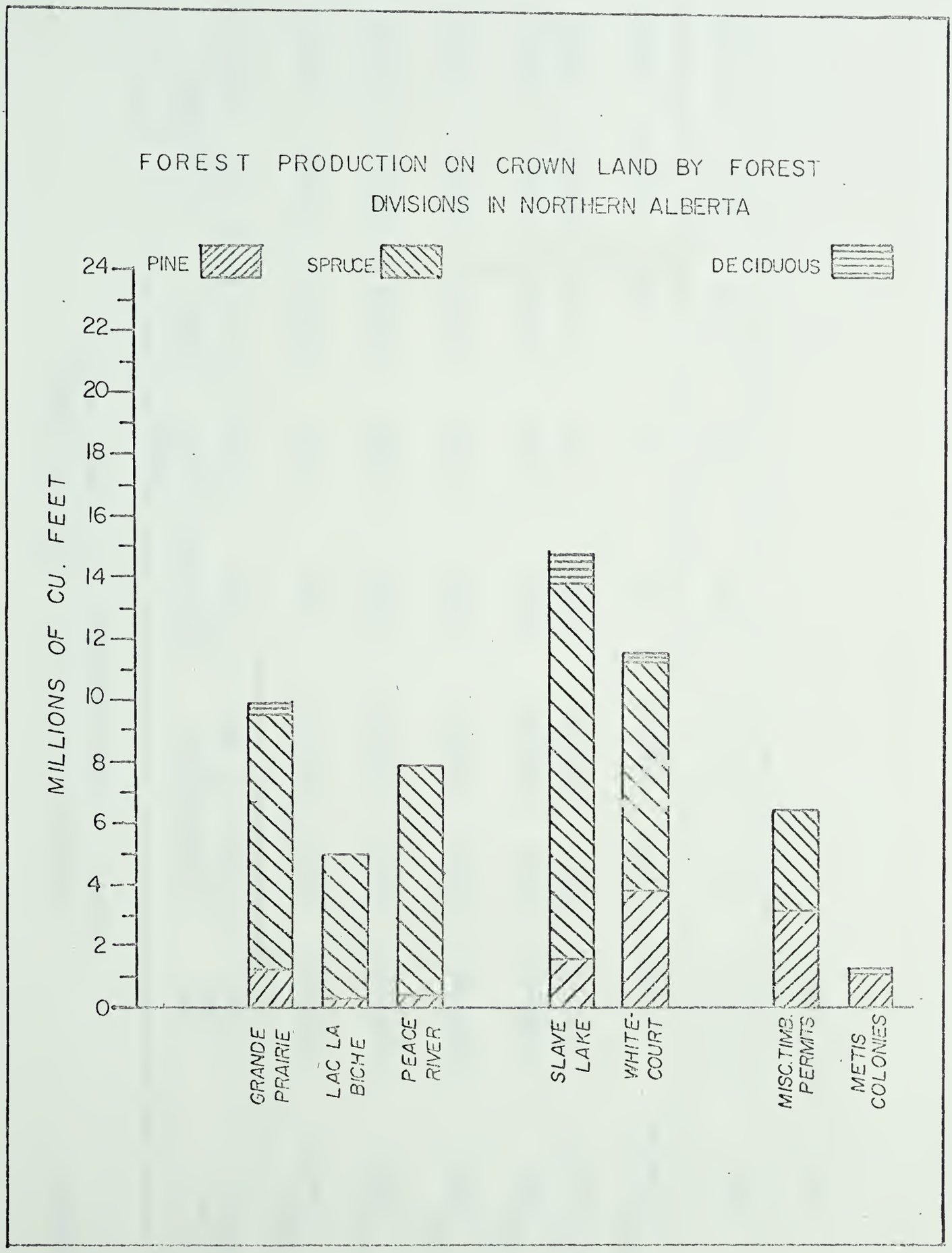

FOREST PRODUCTION ON CROWN LAND BY FOREST DIVISIONS IN NORTHERN ALBERTA
PINE
SPRUCE
DECIDUOUS
MILLIONS OF CU. FEET
0
2
4
6
8
10
12
14
16
18
20
22
24
GRANDE PRAIRIE
LAC LA BICHE
PEACE RIVER
SLAVE LAKE
WHITE-COURT
MISC. TIMB. PERMITS
METIS COLONIES

figure 6

Table IV

TOTAL VOLUME BY SPECIES - 1958 FORESTED AREA

MILLIONS OF CORDS AND MILLIONS OF FOOT BOARD MEASURE

Forest Division	Area in Acres	White Spruce 4" -11" M.Cords	White Spruce 12" + M. FBM	Black Spruce 4" + M. FBM	Balsam Fir 4" + M.Cords	Pine 4" - 10" M. Cords	Deciduous 11" + M. FBM	Deciduous 4" + M.Cords
Grande Prairie	3,678,397	9,485	2,762,340	819	1,721	14,594	1,779,274	29,140
Lac La Biche	8,537,518	12,449	3,995,586	4,732	1,240	16,630	2,087,325	46,184
Peace River	10,881,893	23,167	7,707,444	3,311	1,094	8,925	1,507,526	77,448
Slave Lake	5,390,641	17,798	5,531,028	3,147	2,237	8,533	1,675,149	65,870
Whitecourt	3,141,439	10,827	2,653,991	1,916	1,621	14,930	2,380,078	28,803
Metis Colonies	474,672	950	351,047	54	51	113	27,169	4,997
Totals	32,104,560	74,676	23,001,436	13,979	7,964	63,724	9,456,521	252,402

Source: Same as Table I.

Table V

AVERAGE VOLUME PER ACRE - 1958 FORESTED AREA

CUBIC FEET (4" D.B.H. and Over)

Forest Divisions	Area in Acres	White Spruce	Black Spruce	Balsam Fir	Pine	Total Coniferous	Deciduous	Total
Grande Prairie	3,678,397	361	19	40	428	848	673	1,521
Lac La Biche	8,537,518	212	47	12	212	481	459	942
Peace River	10,881,893	315	41	8	97	461	605	1,066
Slave Lake	5,390,641	475	50	35	193	753	1,039	1,792
Whitecourt	3,141,439	453	52	44	547	1,096	779	1,875
Metis Colonies	474,672	310	10	9	31	360	894	1,254
Totals	32,104,560	2,126	219	148	1,508	3,999	4,449	8,450

Source: Same as Table I.

Table VI

ALLOWABLE ANNUAL CUT

GROSS ALLOWABLE ANNUAL CUT*

Division	Coniferous Sawlogs M. F.B.M.	Coniferous Pulpwood M. Cords	Total Coniferous M. Cu. Ft.	Deciduous in M. Cords	Deciduous in M. Cu. Ft.	Total M. Cu. Ft.
Grande Prairie	89,764	665	73,494	833	70,805	144,299
Lac La Biche	119,042	876	96,963	1,320	112,200	209,163
Peace River	173,636	962	114,594	2,213	188,105	302,699
Slave Lake	137,789	793	93,452	1,882	159,970	253,422
Whitecourt	101,146	732	81,340	823	69,955	151,295
Metis Colonies	6,987	29	3,786	143	12,155	15,941
Totals	628,364	4,057	463,629	7,214	613,190	1,076,819

* Based on the following rotations using Von Mantel's Formula.

White Spruce Sawlogs	=	110 years
Pine Sawlogs	=	90 years
Coniferous Pulpwood	=	80 years
Deciduous Pulpwood	=	70 years

Converting Factors:

1 Cubic Ft.	=	5.29 board feet
1 Cord	=	450 board feet
1 Cord	=	85 Cubic feet

Source: Same as Table I.

Table VII AVERAGE ANNUAL FOREST PRODUCTION ON CROWN LANDS BY DIVISIONS AND PRODUCTS

BASED ON FIVE YEAR PERIOD Aug. 1, 1954 to July 31, 1959.

Product	Grande Prairie	Lac La Biche	Peace River	Slave Lake	White-court	Metis Colonies	Misc. Timber Permits	Totals
Lumber (M. F.B.M.)	49,180	26,389	41,981	70,922	54,917	5,820	15,516	264,725
Railway Ties (Pieces)	533	11,318	299	62,515	165,370			240,035
Plywood (M. F.B.M.)	3,096			4,048	621			7,765
Pulpwood (Cords)	141	225	41	1,748	506	900	22,180	25,741
Poles & Piling (M. Lin. Ft.)	13	18	60	14	15		2	122
Building Logs (M. Lin. Ft.)					1			1
Round Timber (M. Lin. Ft.)	3	21	10		2		5,364	5,400
Fuelwood (Cords)	4	10	3		12		8,484	8,513
Shingles (M. Pieces)							8	8
Slabs (Cords)	8	14		19	76			117
Lath (M. Pieces)		146		19	109			274
Plugwood (Cords)					153			153

Source: Same as Table I.

May 1966, after almost fourteen years of Provincial Government consideration. The Alberta Forest Products Association, which acts as representative of the forest products industries, petitioned the Premier in 1964 for "a system of timber allocation on a continuous quota basis",[3] similar to that of British Columbia.

The previous policy of selling timber berths[4] to the highest bidder regardless of other licenses and investments adjacent to the timber being sold, resulted in high over-bids and operating costs for many timber licensees. For example "the average over-bid during the 1963 - 64 operating year was approximately $6.00 per thousand board feet over the upset price of $5.05 per thousand board feet"[5] for western white spruce. In other words most timber licensees bid an average stumpage fee[6] of $11.05 per thousand board feet for timber that was valued at $5.05 per thousand board feet by the Provincial Government. (If a timber licensee bid below $5.05 per thousand board feet, his bid was disqualified by the Provincial Government). This has resulted in careless, "cut-and-get-out" logging practices as well as financial problems and timber tenure insecurity for many small operators.

In both systems of timber disposal the Province has levied a series of fees on the timber berth or quota holders in the form of annual fees ($10.00), ground rent or holding charges, ($30.00 per

---

3. The Quota System of Timber Disposal. Alberta, Dept. of Lands and Forests. Edmonton. April 1965.

4. Timber berth. See Glossary.

5. Quota System. Loc. Cit.

6. Stumpage fees. See Glossary.

square mile in the berth or quota) fire protection charges ($19.20 per square mile) and cruising charges[7] ($0.25 per acre for coniferous and mixed wood stands; $0.15 per acre for deciduous stands). These fees are paid in addition to the aforementioned stumpage fees which are paid in accordance with the size of the berth or quota and with the species type harvested. As was noted previously, western white spruce is valued at $5.05 per thousand board feet by the Provincial Government. Poplar, considered as a weed species, is valued at approximately $0.25 per thousand board feet, which is of considerable advantage to some plywood producers. Stumpage fee payments are not due until the logs have been removed from forest land. This is of great financial help to plywood producers, for example, because under this system capital is not tied up in piles of logs at remote railway sidings awaiting shipment to the mills.

Location of Harvesting Activity

Figure 7 illustrates the location of the more valuable timber stands which are largely contained in lands closed to settlement as shown in Figure 8; Figure 9 illustrates the number and location of the sawmills and logging shows in the study area. The locations of the vast majority of the logging shows and sawmills, not surprisingly, coincides with the more accessible and marketable stands of western white spruce, pine and poplar in Northern Alberta.

---

7 Cruising Charges- See Glossary

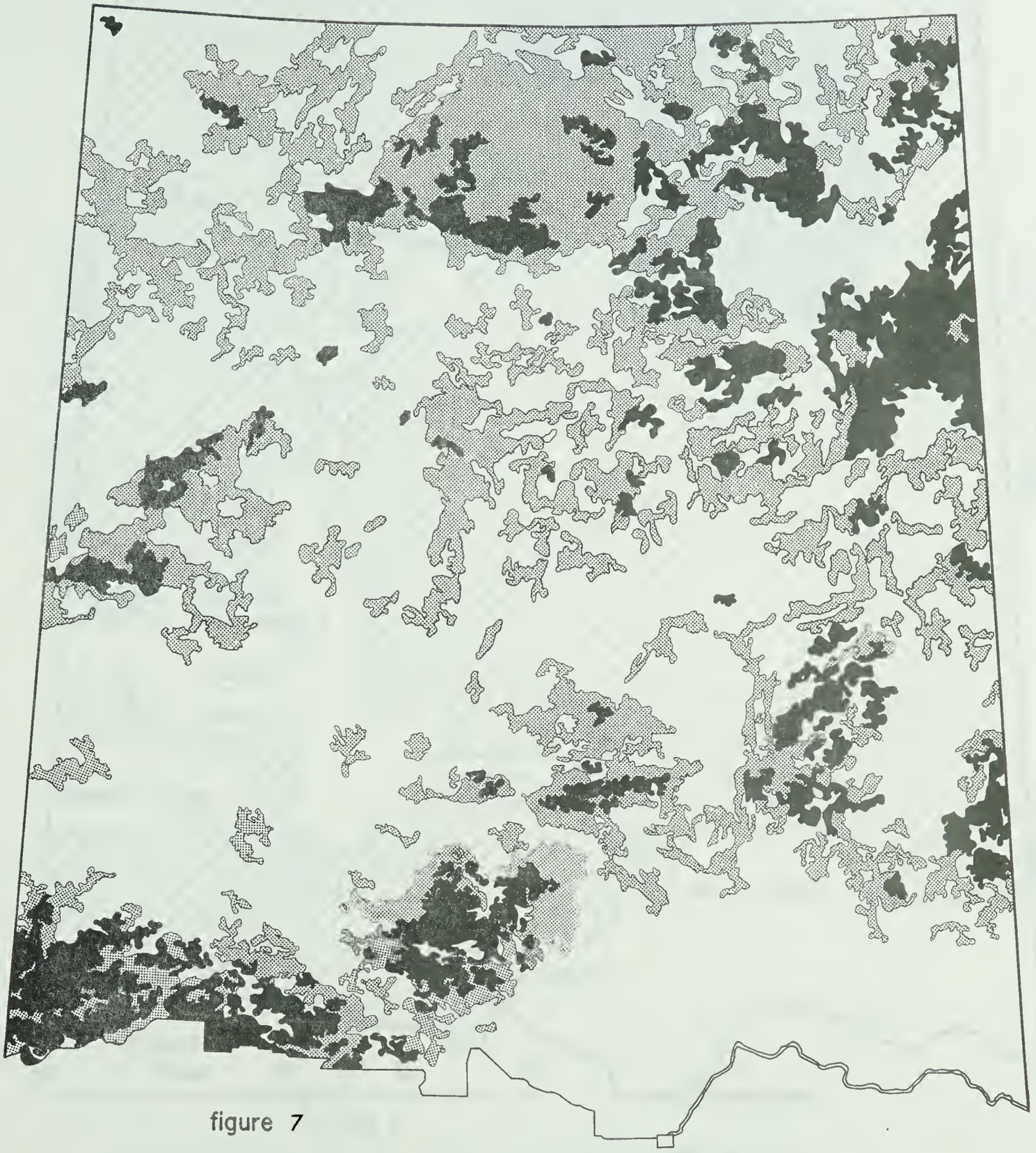


figure 7

MERCHANTABLE TIMBER STANDS IN NORTHERN ALBERTA

CONIFEROUS FOREST

MIXED-WOOD FOREST

SCALE:

50 25 0 miles 50 100

R.B.M. (BASE MAP-SAVAGE)

COURTESY of the "ATLAS of ALBERTA"

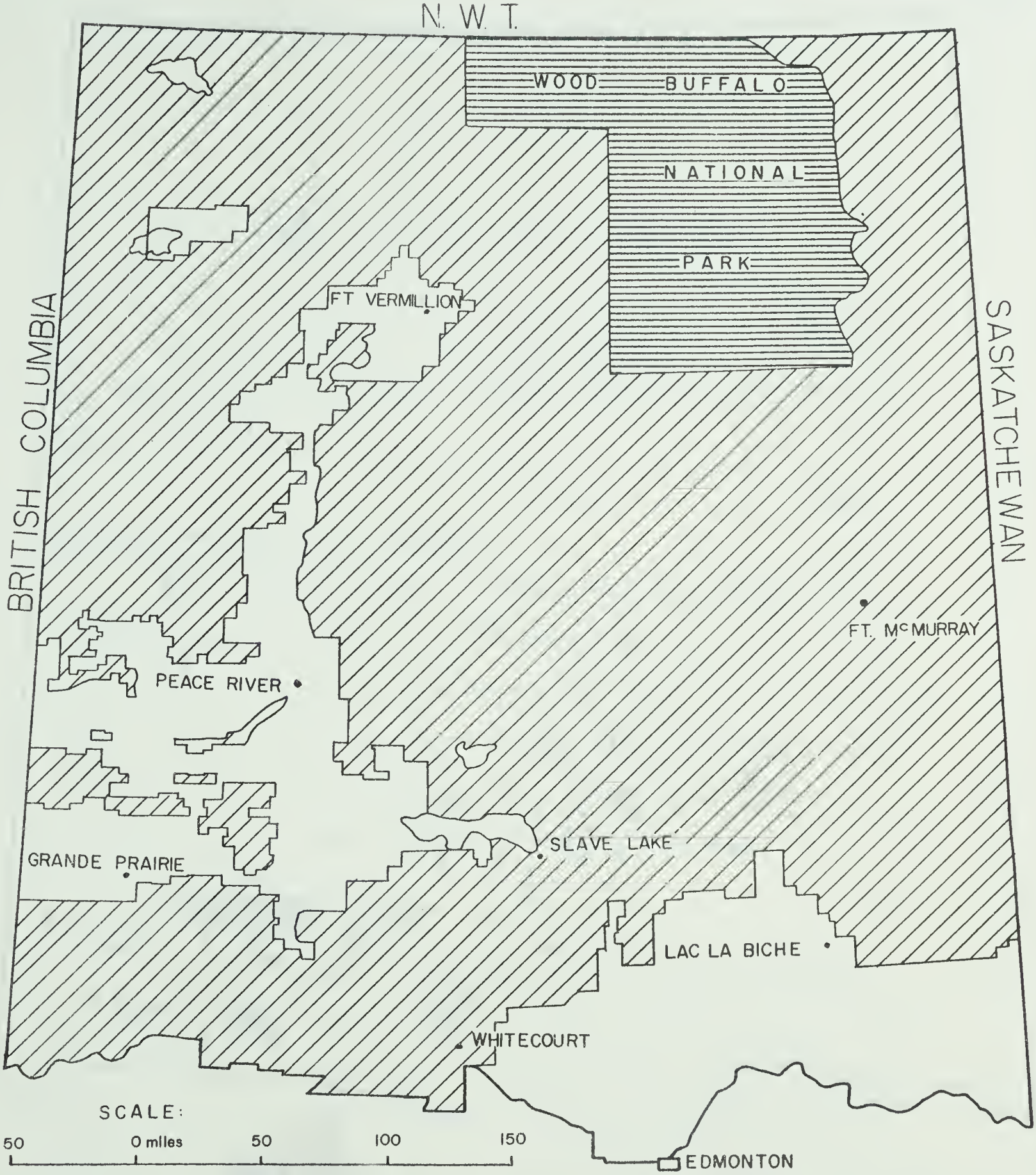


figure 8

LANDS CLOSED TO SETTLEMENT

LANDS SETTLED & OPEN TO SETTLEMENT

WOOD BUFFALO NATIONAL PARK

Derived from a Department of Lands and Forests Map in the Alberta Forest Inventory, 1965.

LANDS CLOSED & OPEN TO SETTLEMENT IN NORTHERN ALBERTA

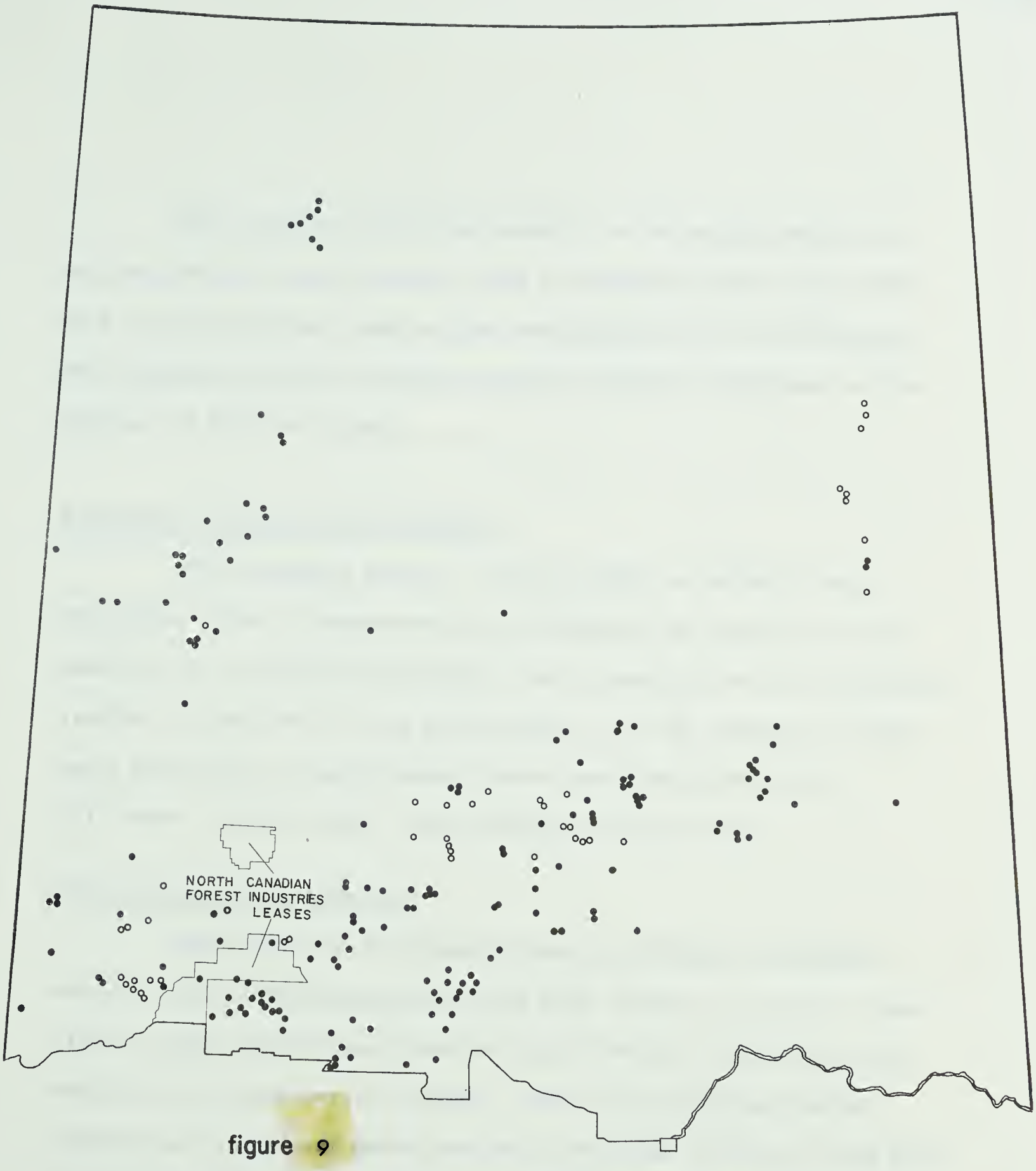


figure 9

DISTRIBUTION OF SAWMILLS AND LOGGING SHOWS IN NORTHERN ALBERTA (1960-1965)

• LOGGING SHOW WITH SAWMILL

◦ LOGGING SHOW WITHOUT SAWMILL

SCALE:

50 25 0 miles 50 100

R.B.M.

Refer to APPENDIX E

The location of the bush sawmill on the logging show site has been the most common sawmill site in Northern Alberta since 1940. This is the locational feature that distinguishes the log collection and conversion system of Northern Alberta from its counterpart in the interior of British Columbia.

Locational Factors of Bush Sawmills

The following factors, listed in what is probably their descending order of importance, have influenced the location of bush sawmills: (1) overland log transport costs coupled with log utilization levels, (2) the lack of wood waste markets, (3) the presence of small scale producers, (4) governmental forest administration policy, (5) labour, and (6) timber stand (density) and tree size.

Costly Overland Log Transport

The major part of forest harvesting activity in Northern Alberta, since 1940 approximately, has been located in the major interfluvial areas; that is away from the larger rivers. Therefore, logs have had to be transported overland. Even the increasing size and capacity of trucks used during and since World War II has not been able to handle this type of load economically.[8] Therefore the excessive initial bulk of the log had to be trimmed down at or near the nomadic logging show sites. This was the function of the portable bush sawmill.

---

8. Field Research. Summer 1966.

Lack of Wood Waste Markets

High log waste levels have been common in northern Alberta due to the use of portable bush sawmills in trimming off the excessive bulk of the sawlog. The general persistence of the decentralized milling method is partly due to a lack of readily accessible wood waste markets such as pulp and paper mills. Additional revenue gained through the sale of wood waste, otherwise normally burned, has in one instance, paid for the cost of debarking and chipping machinery.[9]

In the Prince George, B.C., region, for example, three pulp and paper mills came into operation during 1964 and 1965. Since these mills desired to purchase all possible supplemental pulp chip supplies, an opportunity was presented to the surrounding lumber producers to raise their log utilization levels to as high as 90 per cent. Through the use of chippers and log debarkers, waste materials such as edgings, trimmings and slabs could be converted to saleable pulp chips, thus enabling a lumber producer to realize greater profit from each log. Consequently, the producer could market lumber at a lower price than he otherwise could have done, because the pulp chip sales tend to subsidize the production cost of the lumber.

The functional integration of lumber and pulp-and-paper producers in the Prince George region prompted a widespread revolution in the minimum economic size of a lumber producing unit. Those producers who were not large enough to afford expensive wood chipping and possible log debarking machinery were absorbed by those that could. Eventually the actual number of mills producing lumber was considerably reduced,

---

9. Pers. Comm. Mr. G. A. Patterson. North Canadian Forest Industries. Grande Prairie, 1966.

while the minimum economic size of the remaining units was greatly increased.

Of geographic significance is the widespread tendency toward centralization. Good portable log debarking and wood chipping machinery has not yet been developed. Consequently, such machinery must be located at a permanent central location. Since the debarker, sawmill and chipper form, in that order, a technically integral unit, the need to locate the sawmill adjacent to the balance of machinery is obvious.

Undoubtedly, a similar functional integration will develop in Alberta when more pulp mills are built. The Northwest Pulp and Power Mill at Hinton has, in the past, chosen not to purchase chips from the surrounding potential suppliers. A situation similar to the Prince George region will not develop in the Hinton area so long as such a policy exists.

The Presence of Small Scale Producers

During the post-war lumber market expansion many of the established Northern Alberta producers initiated major expansions throughout their production systems. Consequently, they disposed of much equipment, still usable, which became available at low cost. Equpped with a low initial investment and a variety of used equipment a small operator was able to begin profitable lumber production. The relatively large number of logging show sites within a 150 mile radius of Edmonton has been attributed to this type of small producer.

Government Forest Administration and Business Policies

The Provincial Government's former business philosophy and timber disposal methods have proven to be an important locational factor.

The Province's post-war laissez-faire policy regarding the forest products industry has been the major reason for the retarded completion of a forest inventory and sustained yield forestry legislation (the Quota System).

The concept of tiny timber berths as a method of timber disposal (through disposal of the timber cutting rights) suits the smallest producers, but is obsolete when applied to the larger, wealthier producers such as Swanson Lumber and Imperial Lumber. Such companies have been in a position to afford reforestation for over a decade. The negligible amount of government initiative in encouraging these large producers to convert harvest methods to a sustained yield basis, which would include the allotment of large blocks of timber, has been partly responsible for creating an unhealthy, marginal lumber industry.

A situation developed in which it became impractical for a licensee to consider undeveloped adjacent supplies of timber as guaranteed sources of future raw material. This leads, in part, to careless cutting policies where the licensees cut as much timber in his timber berth as he legally and physically could before the expiry date. This was because it was to his advantage to clear cut stands of preferred species rather than to cut on a selective basis.[10] Clear cutting is a less costly method of harvesting trees partly because it can be more systematically employed, and partly because larger machines can be used, thus decreasing the amount of labour needed. The problem

---

10. Selective cutting or thinning can be practised according to two points of view:
    (1) Claiming the best trees for purposes of profit.
    (2) Leaving the best trees for purposes of healthy regeneration.

with clear cutting is that, often, too few or no trees are left to act as a source of seed, and without these, no natural regeneration will take place.

Since costly regenerative harvesting techiniques were not being employed there was no need to attempt to defray the extra cost. Therefore, operators did not attempt to attain higher log utilization level which would have the effect of raising the profit gained from each log. This in turn freed the operator from the necessity of centralizing his operations. Because the need for centralization did not exist, geographic dispersal of sawmilling proved to be the most profitable form of operation.

Labour

Labour problems caused a small number of producers to centralize their milling operations during 1965 and 1966. Inducing key skilled labour to remain at length in isolated bush sawmill camps during winter was becoming increasingly difficult, regardless of wage compensation. Mr. H. Nicholson (owner: H. R. and R. Lumber Co.) and Mr. George Buchanan (owner: Buchanan Lumber Co.) claimed to have moved their sawmills into Fairview and High Prairie respectively because their key, skilled labour preferred to work in an urban environment. It is interesting to note, however, that neither of the sawmills was relocated in such a way that it formed an integral unit with the company's planer.

Low Density Timber Stands and Smaller Trees

The potential peeler or sawlog tree of Northern Alberta is regarded by Provincial Foresters[11] and members of the industry[12] as a smaller and scarcer variety than is the one found in either coastal or interior British Columbia. Therefore it can be reasoned that logging shows must be more widely distributed and numerically more abundant than in the west coast province. In a personal interview, Mr. Tom Matty of Swanson Lumber claimed that an Alberta feller can cut approximately 10,000 foot board measure per day while his interior B. C. counterpart can fell 15,000 foot board measure.[13] This difference can be attributed to the larger B. C. trees, which tend to constitute more extensive and more homogeneous forests than Northern Alberta site conditions permit.

The actual location of the logging shows within the area for which the operator holds a licence is governed by a number of factors, some of which are related to the problems involved in the location and relocation of the sawmill. As was stated above the most valuable stands of marketable timber in Northern Alberta tend, because of the nature of the physical environment, to grow in separate and scattered areas. For this reason, and also because the stands contain modest amounts of timber, if an operator concentrates his cutting activities in one stand or in a few in close proximity to each other, they will be

---

11. Pers. Comm., Mr. R. D. Loomis, Chief Forest Administrator, Alberta. Dept. of Lands and Forests.

12. Pers. Comm., Mr. Jack Ostergaard, Forest Operations Manager, Weldwood of Canada, Ltd.

13. Foot Board Measure. See Glossary.

quickly exhausted. He must then either skid[14] the logs a considerable distance to his sawmill or relocate it. But the latter is a time consuming operation, as it takes six weeks to disassemble, move and remount this type of mill before it is again operational. It is therefore normal for an operator to disperse his logging shows fairly widely. Indeed, so great are the problems of relocating a bush sawmill that there is even a tendency for operators to employ more than one mill, each of which is supplied by three or four logging shows. In this way relocation of the mills is kept to a minimum, and at the same time skidding distances do not rise much above one and a half to three miles. So widespread is this practice that it presumably represents a clear economic advantages under prevailing technological conditions. However it should be noticed that there has been tendency in recent years to replace the bush sawmills by a single larger mill located in close proximity to the planer mill.

Locational Factors of the Planer Mills

Twenty-seven of the thirty-seven planer mills in the study area are located adjacent to a common carrier railroad. These mills were established on railside locations in order to facilitate the marketing of finished lumber beyond the local region.

Fixed rail rates have been set up in recent years, through common agreement amongst the railroads of Canada and the U.S.A., and are illustrated briefly in TableVIII.These fixed rail rates allow all Northern Alberta lumber producers to compete successfully with each

---

14. Skidding is the act of dragging logs with one end of the log raised off the ground, behind specially equipped trucks or tractors. (See Glossary).

other, for example, on the Montreal market. As a consequence there has been little tendency towards the spatial concentration of log harvesting and milling operations.

Table VIII BLANKET RAIL RATES FOR LUMBER: Per 100 lbs.[14A]

Grande Prairie to:	Montreal	= $ 1.59
	Toronto	= $ 1.56
Waterways or Grande Prairie to:	Chicago	= $ 1.32
	Most New England States	= $ 1.41

Ten planing mills in the study area are located away from railroads. If shipment to eastern markets was to be undertaken the added cost of trucking the lumber from mill to railhead, plus transhipment would have to be borne by the producer. Seven of the eleven mills tend to market in the Edmonton area mainly because they are within an accepted economic truck shipping radius of 150 miles.[15] It was found in the study area that most of the planer mills within 150 miles of Edmonton were owned and operated by one man. They have survived largely because of their proximityto the Edmonton market, to which they give better service than can the more remote mills. Two planer mills in the Peace River region, located at Bezanson and Smith Mills, are not located on a railway, serve the local market. Another non-railside planer mill is located at Ft. Chipewyan, just east of its timber supply in Wood Buffalo National Park. It ships its finished

14A. Pers. Comm., Mr. G. Walker. Northern Alberta Railways. 1966.
15. Pers. Comm., Mr. Tom Matty, Swanson Lumber Co., 1966.

lumber on Northern Transportation barges up the Athabasca River to the N.A.R. railhead at Waterways.[16] To help defray the extra expenditure of barge shipment and extra bush labour costs, Swanson Lumber Company, the owners of the sawmill planer combination, negotiated a contract with the Federal Dept. of Northern Affairs and Natural Resources in 1955, which allowed for very low stumpage fees, without which the logs could not be economically marketed. The Federal Government initiated the contract because the white spruce stands involved were already mature to over-mature.

Plywood Mills

There are three plywood mills in the study area, two in Edmonton and one in Grande Prairie. The latter mill taps a log supply found mainly in the upper Smoky River drainage basin. Full length logs are hauled by truck from as far as 95 miles away to the Grande Prairie sorting yards of North Canadian Forest Industries. Here, the finest grade logs are selected for plywood manufacture, the balance being used for lumber production.

The two Edmonton plywood producers, Weldwood of Canada, and Zeidler Plywood utilize poplar and spruce logs from the northern Swan Hills - Lesser Slave Lake region. Weldwood also obtains logs from the spruce and poplar forests of the lower Athabasca River valley, a few miles to the north and to the southwest of Ft. McMurray. In both of these cutting regions, nine foot logs are trucked to railway sidings, at which point they are shipped by rail to the Edmonton conversion

---

16. The barges carry an average load of from 400,000 to 500,000 f.b.m.

plants. The plywood producers must ship whole logs because of the technical impracticality of establishing bush peeler plants.[17]

Summary

Within the study area most of the logging and sawmilling activity conducted during the period 1960 - 1965 was located in a number of distinct economic regions. These regions were identified on the basis of log and rough sawn lumber movements; that is from the forests to the planer mills. Regardless of the milling method (that is where the sawmill is located), the planer mill can be considered as a type of "central place". This seems to be a direct consequence of the fact that it is only after this final milling step that lumber is sufficiently refined to be considered saleable on the retail market.

There exists a growing justification in describing the planer mills as the focii of wood movement. In an increasing number of cases lumber producers are trucking their log supply from forest to a central place where they have relocated their sawmills. These are normally adjacent to, though not usually integrated with the planer mills. As a result, greater functional importance is attached to these focii or "central places".

Figures 10, 11 and 12 illustrate the location of the major focii, while Figure 13 shows the transport net that affects the location of the major focii. Logs harvested in the Upper Smoky River, for example, were destined for the Grande Prairie area planer mills. Rough sawn lumber from the southern Swan Hills was fed into planers located at Whitecourt, Swan Hills and Ft. Assiniboine. Rough sawn lumber and a small quantity of logs from the northern Swan Hills and Lesser Slave

17. See Appendix B.

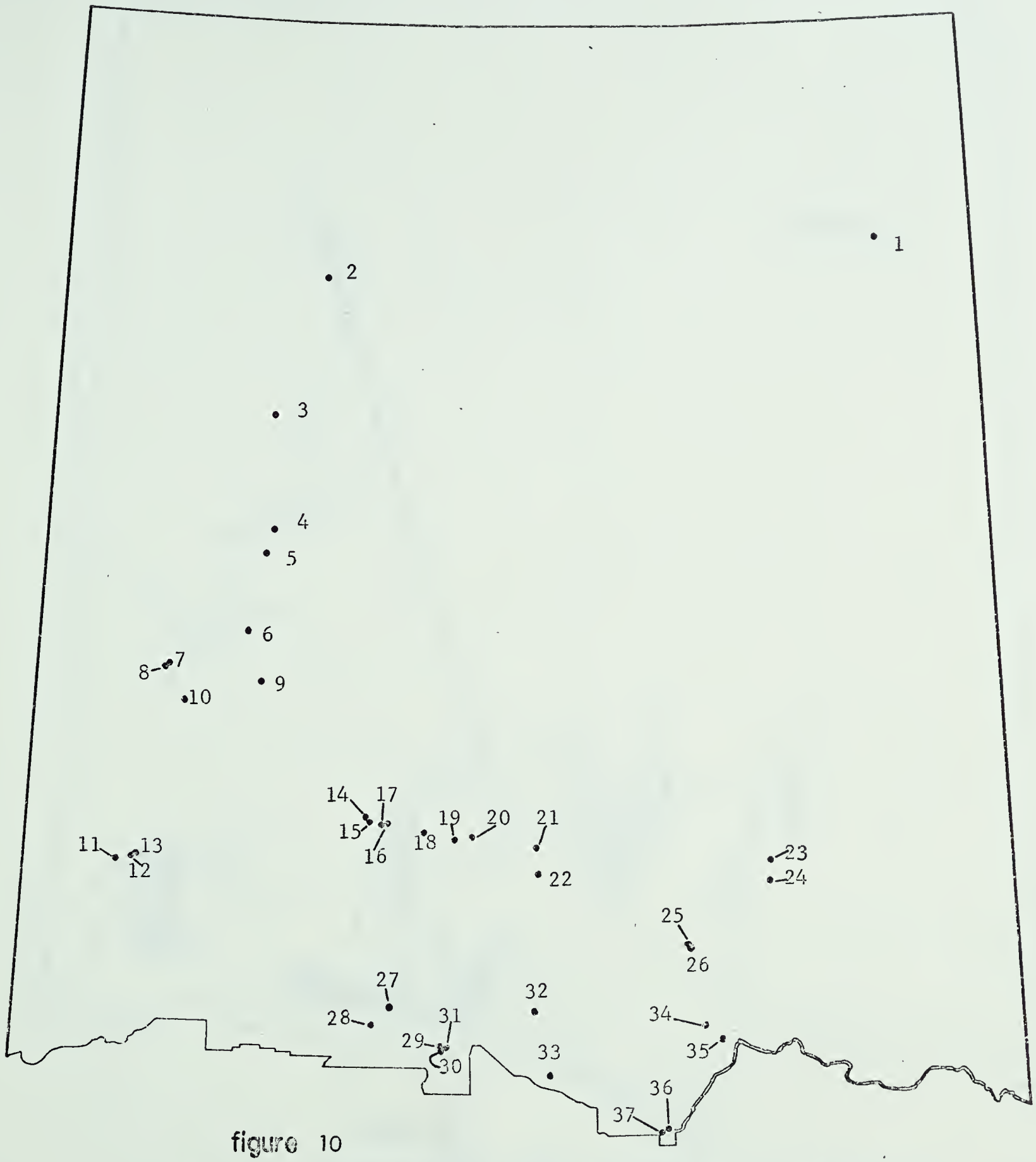


figure 10

DISTRIBUTION OF PLANER MILLS IN NORTHERN ALBERTA 1960-1965

ONE DOT = ONE PLANER MILL

FOR DOT REFERENCE NUMBERS:
SEE APPENDIX D

SCALE:
50 25 0 miles 50 100

R.B.M.

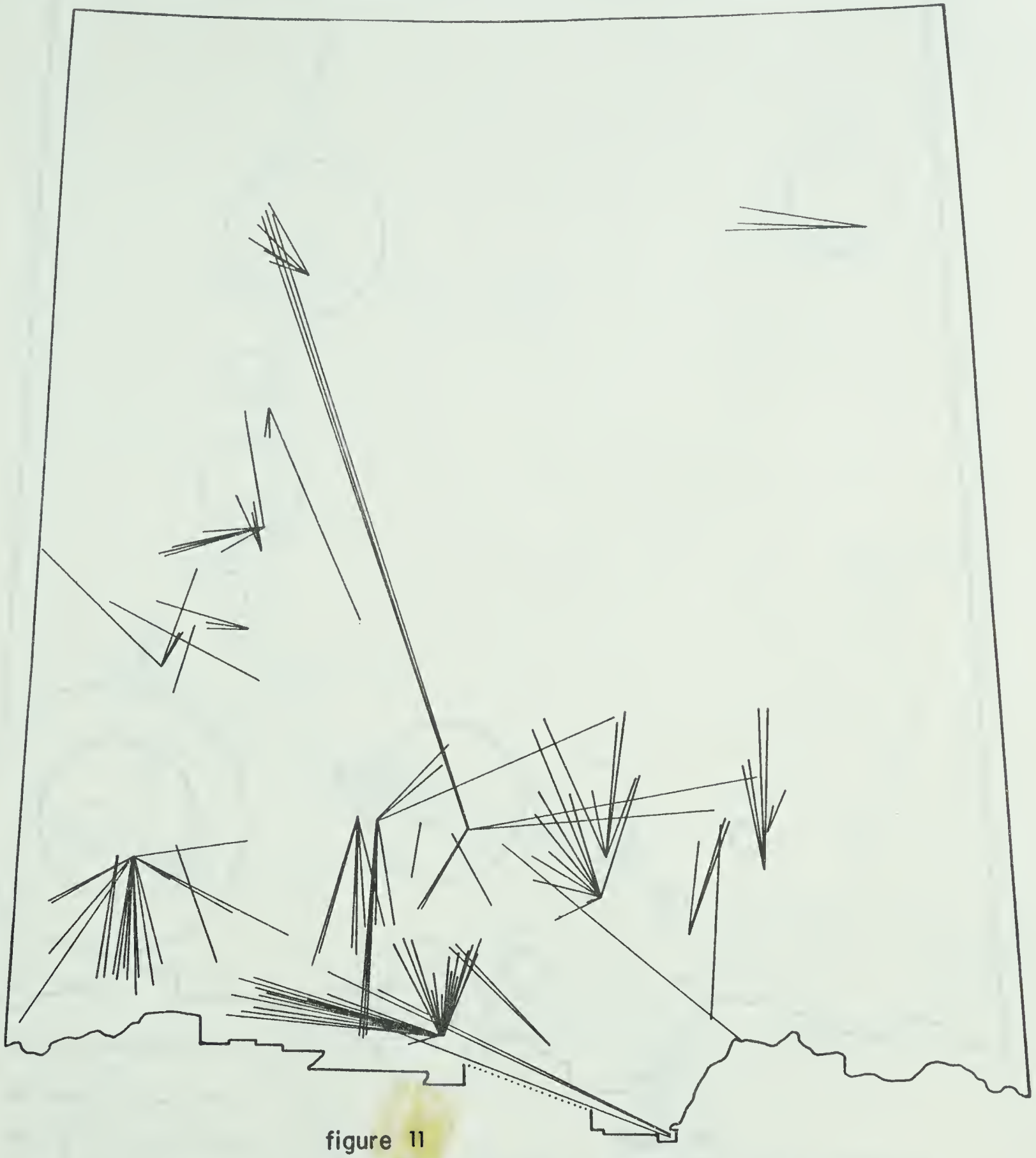


figure 11

SIMPLIFIED RAW MATERIAL FLOW

FROM FOREST TO PLANER MILL

1960 - 1965

SCALE

50 25 0 miles 50 100 150

R.B.M.

Refer to APPENDIX E

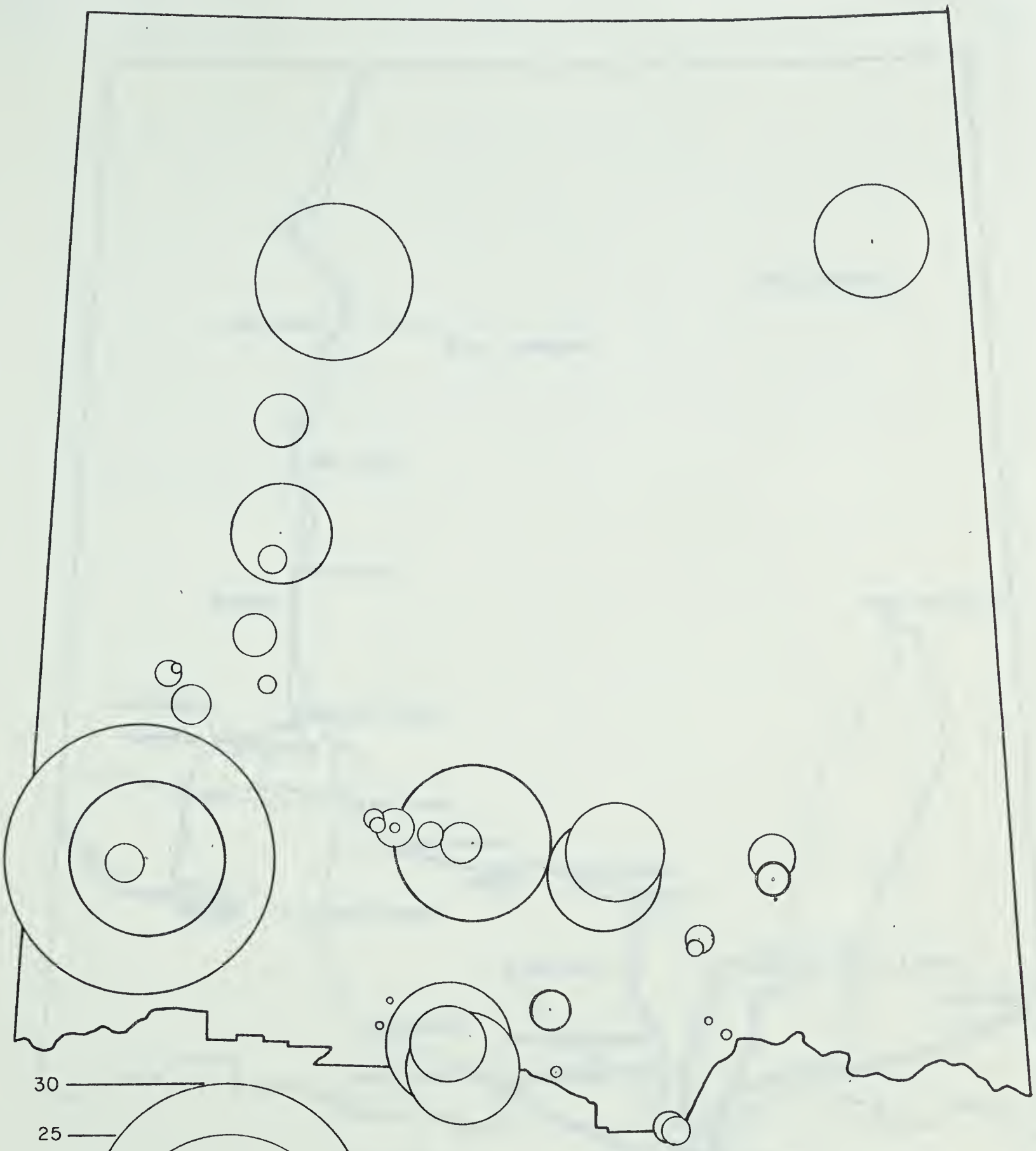


figure 12

FINISHED LUMBER PRODUCTION IN NORTHERN ALBERTA

per million foot board measure annually – 1960-1965

R.B.M.

Refer to APPENDIX C

Lake region were trucked into planers located adjacent to the Northern Alberta Railway line. Logs, harvested in the Calling Lake region were, in rough sawn lumber form, destined for Athabasca planer mills while those from the Lac La Biche region were funnelled into the planers at Lac La Biche, Amesbury, and Pelican Portage. Some logs from both the Calling Lake and Lac La Biche regions were cut by two very small operators whose planer mills were located on farms close to the towns of Waskateneau and Thorhild.

CHAPTER IV

THE CHANGING STRUCTURE OF THE PRODUCTION UNITS

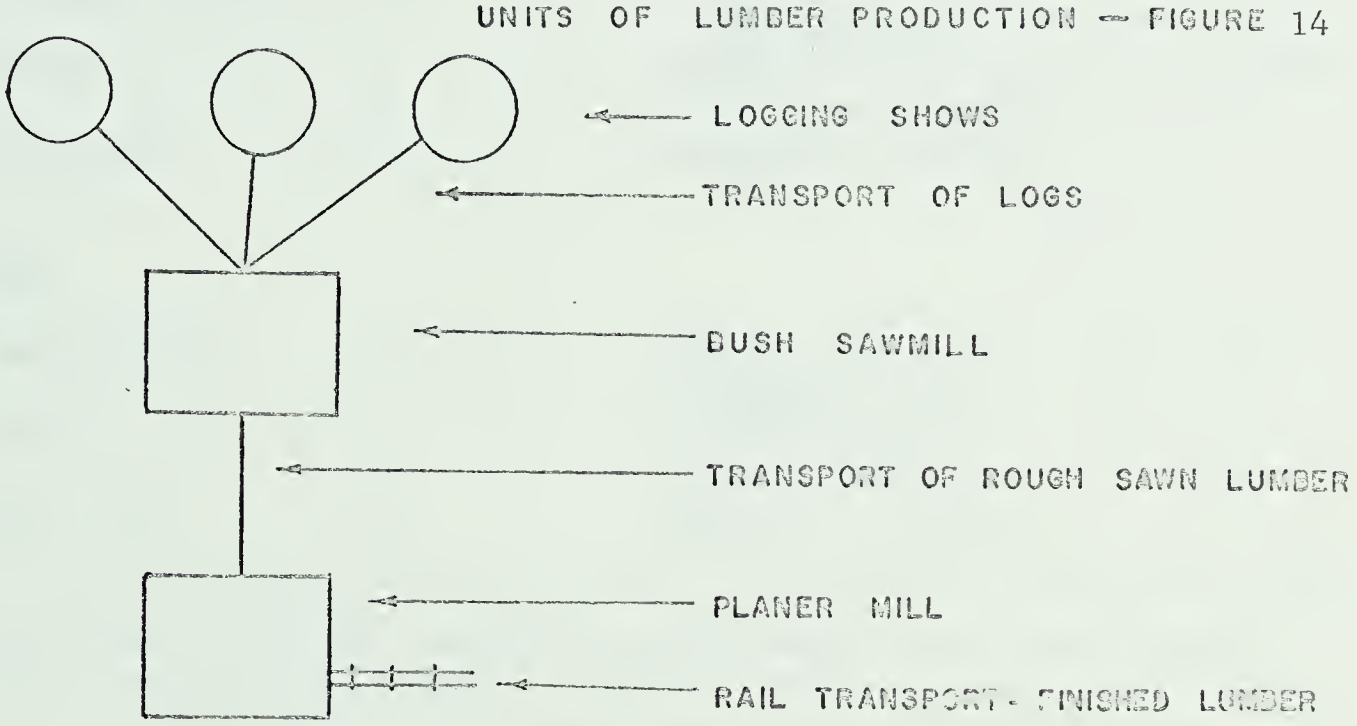
The intention of this chapter is to analyse the structure of the lumber industry in Northern Alberta, using the information presented in the preceeding chapters supported by further material gained from field work. The approach will be through an analysis of the spatial distribution of the factors of production employed at each stage in the productive process, and the changes therein in the post-war period. That is to say, those changes that have occurred in the Northern Alberta lumber industry in response to the increased demand resulting from the growth of the continental market. This will be undertaken with a view to identifying, if possible, the optimum size of producing units under present conditions.

From a review of Chapters II and III it can be seen that the spatial structure of the lumber industry can be represented in diagrammatic form, see Figure 14. It appears that the transformation of a tree in the bush to a finished board/plank on its way to the market involves six stages: cutting and delimbing at the logging show; movement of the log to the sawmill; sawing; movement of the cants to the planer; planing (including re-sawing if necessary); and movement of the planks/boards to the market.

At each stage certain "factors of production" are required. In their simplest terms these can be reduced to men, and machinery or equipment (i.e. labour and capital in classic economic terminology). While a thorough analysis of the industry would require the transformation of these descriptive terms into actual costs, some useful insights

into the industry can be obtained by considering simply the number of men and the number of pieces of equipment used at each stage. The relative numbers in each case will be referred to as the factor mix in the following discussion. To add clarity to the economic and geographic structure of the lumber industry in 1966, this writer has compared the factor mix of the five production units that precede the rail transport unit in 1946 and 1966.

UNITS OF LUMBER PRODUCTION — FIGURE 14



The logging show of 1946 made use of a higher ratio of labourers to machinery than the 1966 counterpart. The major reason for this was that in 1946 men had to use axes in the face of a lack of chain saws for tree felling and swamping. As a result, in the former year, up to three tree fellers equipped with double bladed axes were required to match the felling capacity of one man using a chain saw in 1966. Further, approximately twice the number of swampers, equipped with axes, were required to follow behind these three axe-wielding fellers. In summary, a logging show in 1966, usually con-

sisted of nine or ten men, as was outlined in Chapter III, while the logging show of 1946 was more labour intensive, requiring fourteen or fifteen men.

Table IX

FACTOR MIX AT THE SIX PRODUCTION UNITS: 1946 and 1966

	Men		Equip-ment		Men		Equip-ment
1946							
Felling Operation	6	:	6	Skidding (from one logging show)	9	:	3
Sawmill	22	:	1	Rough-sawn hauling (from one sawmill)	2(+1)	:	2(+1)*
Planer mill	12	:	1	Transport to Market			
1966							
Logging Show	2	:	2	Skidding (from one logging show)	8	:	3
Sawmill	11	:	1	Log Hauling (from one landing)	4	:	4
Planer mill	12	:	1	Transport to Market			

* The 2(+1) : 2 (+1) ratio in the 1946 section refers to 2 trucks plus one spare and 2 drivers plus one spare.

The ratio of men to equipment in skidding and log hauling has remained basically similar over the twenty year period; that is, the same number of men, in each of the years, was required to load and operate the skidders, arch-truck skidders or logging trucks. There is a difference however, in the conditions in the two periods because the present day machines are more capable with the result that production has increased markedly. In other words, if an operator used an average of three men to load and operate twelve skidders of equal capacity in 1946, and used the same number of men to load and operate the same

number of skidders in 1966, his daily log hauling capacity in the latter year would be approximately double that of the former.

The factor mix at the sawmills of 1946 was very different from that of the 1966 sawmills. The wide-spread usage of bush sawmills in 1946 has lessened considerably in 1966. Where a number of bush sawmills supplied rough sawn lumber to a planer mill in 1946, it is now becoming common to find one large centralized sawmill supplied with logs from a number of logging shows. This reduces the number of sawyers and sorters required, and the number of pieces of sawmilling equipment. Further, much highly automated equipment is being used in the large 1966 sawmill. (See Appendix B). This applies particularly to the handling of the log once it has been sawn into cants. The cants are automatically moved forward on a conveyor system that feeds them into an edger saw that saws them into numerous pieces. Trim saws have been set up so that they require very little attention. Some of the larger centralized sawmills, such as the North Canadian Forest Industries mill at Grande Prairie, are equipped to process whole logs into cants by merely sweeping them once through the saws. (See Plate XIII). Generally, the method there is to concentrate on the manufacture of one standard item, namely lumber, two inches by four inches and eight feet long. In its simplest form the sawmill used is a "scrag" mill with two parallel circular saws set four inches apart followed by an edger with saws set two inches apart, so that the log is sawn into a four inch cant by a pass through the two circular saws. The cant is then turned on its side and "edged" into the common "two by fours". This type of mill will take logs up to about eight inches in diameter. A variation of this is to use a four saw "scrag" with the four parallel

saws set so that they will produce a two inch plank on each side of a four inch cant. In this case a double edger is usually used, one side to edge the four inch center cant into two inch pieces four inches wide and the other to edge the two inch thick planks into four inch wide pieces. This type of mill will handle logs up to thirteen inches in diameter. The significant features of these mills are high speeds and a small crew. The speed is obtained because the log is swept through the saw blades only once.

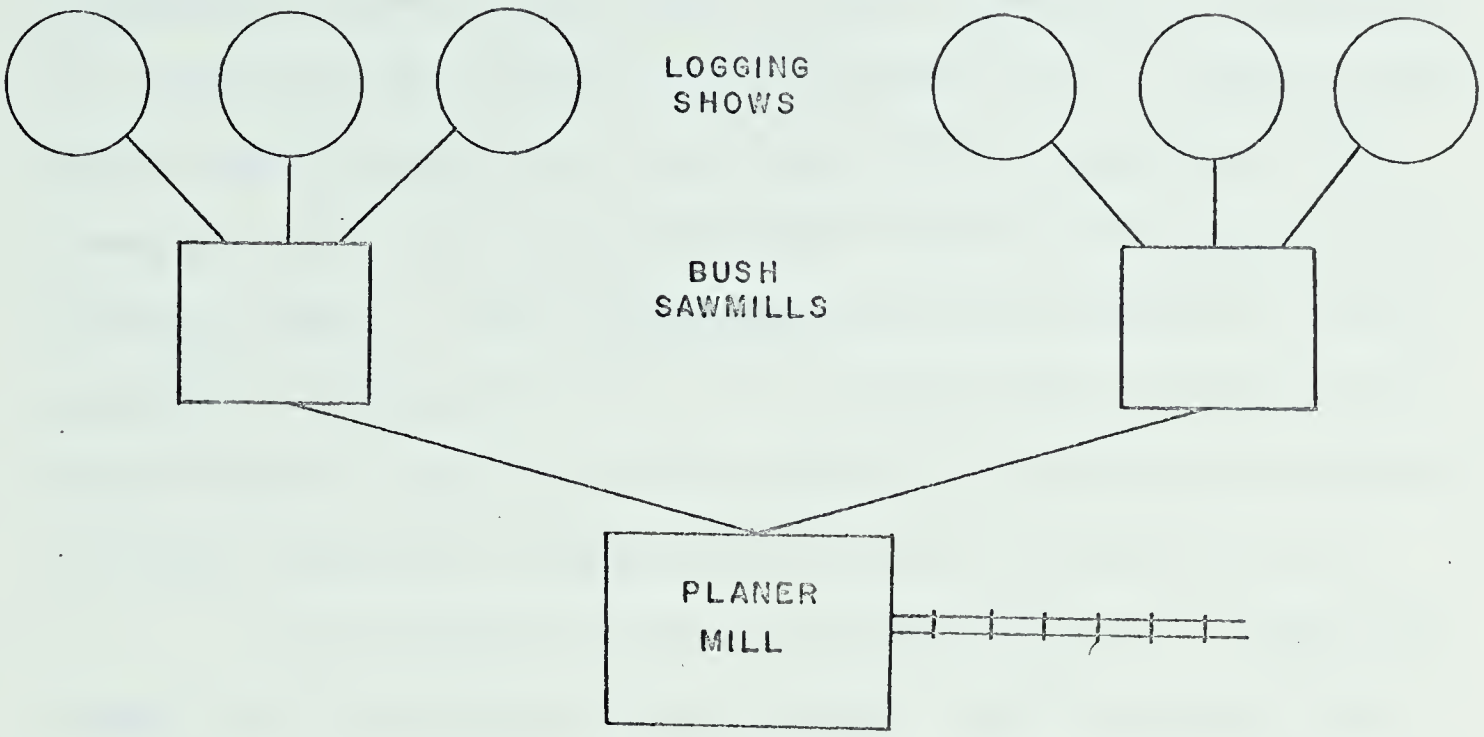
This type of saw has not been utilized by the small operators as yet because it tends to sacrifice quality for quantity. The small operators must try to convert as much of the log as possible into boards, planks, and studs because the small operator burns what he cannot convert while the N.F.C.I. mill chips the wood waste which is then sold. However, this discussion illustrates the fact that the tendency in 1966 was towards more equipment (capital) intensive mills.

Even where bush mills are still used, there has been a change in the factor mix. Western Construction Limited of Whitecourt estimated that the bush sawmill of 1946 required twice the number of men required by the bush sawmill of 1966. This is because the 1966 bush sawmill has been set up much like an assembly line in order to keep labour costs down to a minimum in the face of steeply rising labour wages. Bush sawmills had the same type of equipment in 1946 as in 1966 but were organized more carefully.

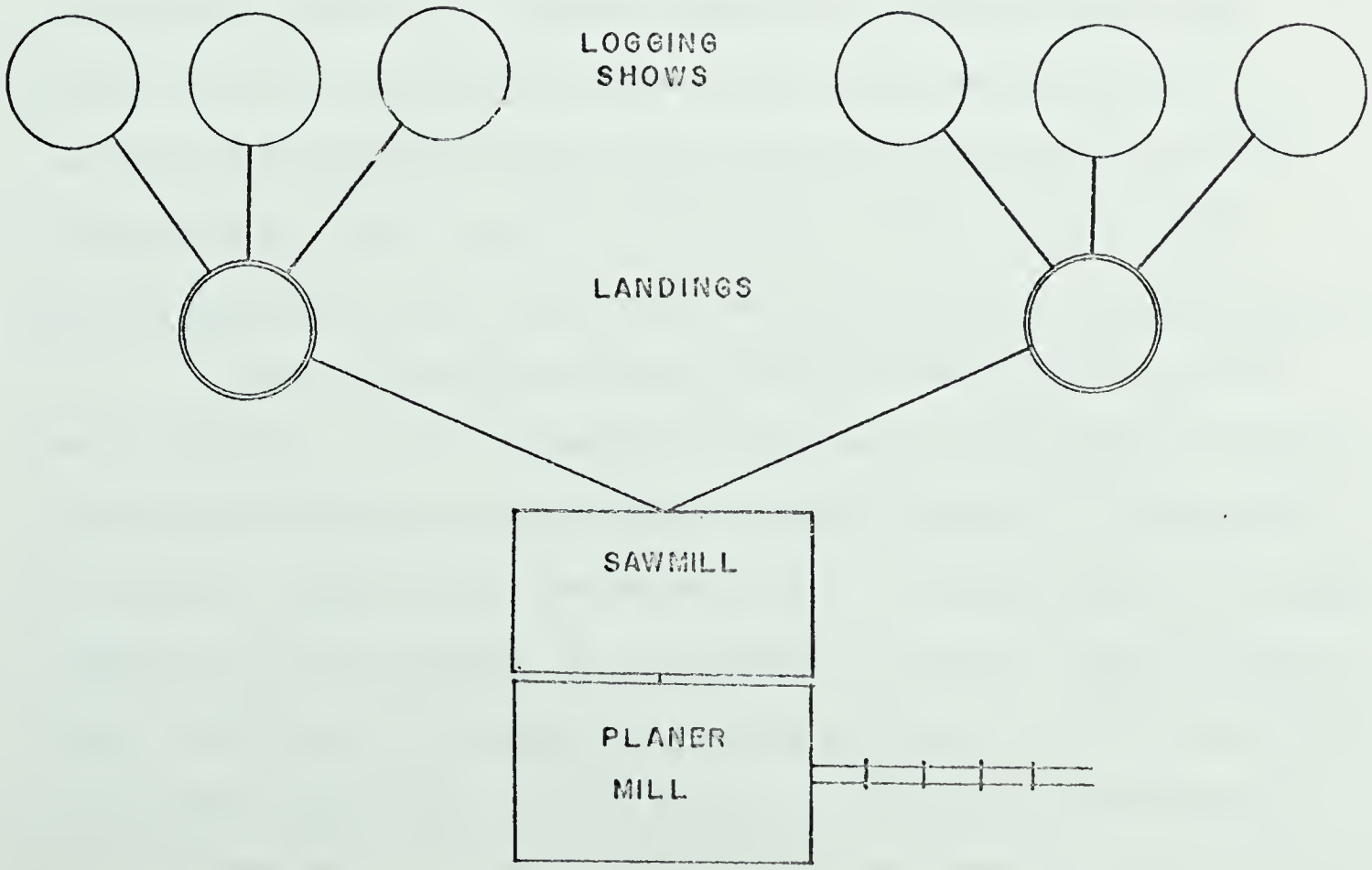
Whether the 1966 lumber producer has his sawmilling centralized or not, he is using approximately one-half the number of labourers at this stage. However, his labour costs tend to be the same because labourers wages are twice as high as in 1946.

Figure 15

Model 1946



Model 1966



in sawmill location and the elimination of the rough-sawn lumber haul. Approximately one-third of the lumber producers in the study area were centralized in 1966 and two-thirds were not. Therefore, in summing up the factor mix, the situation can be described thus: the sawmill factor mix of 1946 involved twice as much labour as the decentralized bush sawmill of 1966. The centralized sawmill requires less labour than the 1966 bush sawmill. Three unnecessary men per bush sawmill are eliminated when centralization occurs. The equipment factor rises, however, because proper loaders and truck trailers are a necessity, for efficiency's sake, regardless of whether the hauling is contracted or not.

If an operator's milling is decentralized, and a rough-sawn lumber haul is necessary, the same argument regarding logging trucks is applicable. Larger trucks reduce the labour element in the factor mix. It is interesting to note that the decentralized bush sawmill system of 1966 has in some cases become so efficient through taking advantage of larger more efficient machinery, that on a short term basis, it is considered as a much more profitable method than the centralized system.[1] This apparent contradiction is probably a result of the ability of the operator in the decentralized system to shift part of his costs to the contractors, who are in effect, subsidizing him.

In the centralized system of milling, the rough-sawn lumber haul disappears. It is replaced by the log haul. The factor mix of the rough-sawn lumber haul is described in Table IX as 2(+1) : 2(+1), while the log haul factor mix is designated as 4 : 4. In both cases, the rough sawn haul and the log haul, the "raw material," (see Plate XXVI), regardless of its form, is being moved by trucks and men. The number of pieces of equipment and numbers of men required in the latter "raw material

---

1. Personal Communication, Mr. A. J. Hamilton, Managing Director, Swanson Lumber Company.

haul" is greater than in the former raw material haul. However, the higher costs incurred, are defrayed by eliminating the numerous bush sawmills and sawyers in favor of one sawmill and one sawyer.

The next stage is that of the planer mill. Here the factor mix has remained unchanged since 1946. In 1946, one planer mill was usually operated by twelve men. In 1966, twenty years later, the required number of men remained unchanged at twelve. Despite the unchanging factor mix, some discussion of the planer is necessary. (See Plates XVII and XVIII).

There are a considerable number of brand-name planers being used by the lumber industry in the study area. Through the course of research, this writer found that there was no "smallest" size"limit"; that is, planers in the study area ranged from the very small to the medium size, (i.e. from 500 board feet per hour to 7,000 board feet per hour). However, it was found that almost all of the producers who operated planer mills that were located on a common carrier railway owned medium sized planers. All of the non-railside planer mills were within 150 miles of Edmonton. As was pointed out in Chapter II, these planer mills are small, and as a result use small planers. One non-railside planer mill in the Peace River country serves a local market and uses a medium sized planer.

All of the railside planers in the study area, excluding those that are located on the Great Slave Lake Railway, were built in 1957 or before. The owners of these pre-1957 mills, regardless of their daily production, tended to choose larger planer machines that were capable of more than the mill was originally intended to process. This was usually done for a good reason: that in case very good market conditions

prevailed more rough sawn lumber could be processed in order to take advantage of the extra profits to be gained. Those planer mills that were built on the Great Slave Lake Railway when it was finished, tended to plan in much the same manner.

However, since 1957, the two recessions in the lumber market, 1957 and 1960, have caused the Northern Alberta lumber producers to reach the conclusion that they were too small. Generally, the industry members felt that, had they produced more finished lumber in the peak market years than they actually did, their financial difficulties during 1957 and 1960 would have been somewhat alleviated. As a result, these producers are currently trying to expand the capacities of their planer mills. This desire to increase their production capacities and hence gain greater viability, is partly attributable to sharpening competition with the western white spruce lumber producers of Northern Interior British Columbia. In general, it was found that because of the very rapid changes in the market since 1957, most of the lumber producers of Northern Alberta had in fact under-estimated the size of planers that would be needed in eight to ten years; that is, at the present time. Since World War II, the Northern Alberta lumber industry has consistently under-estimated the demands of the continental lumber market.[2] Since that time, the planer mill has usually been the point where production slowdowns occurred because operators have been overworking their planers. It was found that most railside producers worked their labour on nine and a half to ten hour days for five or five and a half days a week thus injecting more man hour input to compensate for

---

2. Personal Communication. S. A. Robinson, A.F.P.A.

the slow production rate of the planer, Because of the high initial cost of a dependable planer, most operators felt that they could not justify retiring a good machine too soon even if it was too small, particularly if it was not paid for. Furthermore, most operators felt that it was quite unwise to purchase too large a planer, because the lumber market might collapse. A high speed,[3] one man operated planer costs approximately twice as much as a medium speed planer.[4] The price gap between the high speed and medium speed planers can be pin-pointed as one of the major reasons for the persistence of the latter in Northern Alberta, and hence the high labour inputs observed in the industry.

The sixth production unit, as shown in Table IX is transportation from planer mill to market. However, since transportation, whether rail or road, cannot be considered as being involved in producing lumber, mix factors need not be arrived at.

Table IX illustrates that in four of the production units, felling, sawmilling, skidding, and hauling, factor mix changes have occurred between 1946 and 1966. The sawmilling process has undergone the greatest factor mix change while the skidding operation has undergone the least change, the reasons for which were discussed in the foregoing text. What in fact has happened may be described as a tendency to substitute capital for labour. This has happened and is happening presumably because such a substitution results in a more economical operation.

---

3. High speed planer - 12,000 board feet hourly.

4. Medium speed planer - 6,000 board feet hourly.

The only production unit that has not, in fact, undergone a factor mix change is the planer operation. In the other four active production units, (excluding transportation to market), change in the factor mix is associated with greatly increased productivity. Larger, more capacious machinery has, in general, tended to reduce the role of labour in all production units but the planer. High speed planers are available, and are capable of reducing the labour element in lumber production. However, the persistence of the medium speed planer since 1946 has been largely a result of the very great cost of the high speed planer. It can be seen that, of the five active production units, the fifth is the bottleneck or the governing factor in an operator's annual production rate. This writer would suggest, in the light of the foregoing discussion, that proper adjustment of all other production units to the planer mill's capacity is the key to profitable enterprise.

However, the planer must be geared to process enough rough-sawn lumber to make a self-sufficient operation viable. This writer's findings as a result of research during the summer of 1966 show that most self-sufficient lumber producing operations tended to cluster around the five million foot board measure level.

Table X clearly points out that as a producer's size increases to the five million foot board measure level, involvement in other activities decreases. In other words, as the production capacity decreases below five million board feet annually, it becomes necessary to operate other types of businesses to, in effect, subsidize the lumber operation. That is to say , the five million board foot level appeared to be the largest one-man owned and operated lumber producing unit in the study area. However, some exceptions exist, due largely to the

producer's entrepreneurial and technical abilities. (See Table X).

Above the ten million foot board measure level, there was also a greater tendency towards involvement in other related businesses or industries. By way of venturing a possible reason for this fact, it seems reasonable to assume that, from the description of the subsidiary industries in Table X, this group of larger producers are attempting to guarantee a market that will absorb their high annual lumber production rate. This writer found that only two producers out of fourteen who were producing less than four million level were solely involved in the industry. Every one of the twelve remaining producers was engaged in another business: either a service station garage, a farm, an equipment rental business or construction contracting business. Two of these fourteen producers chose to raise their profit or income levels by engaging in the retail lumber sales business as well as production. Another two of the fourteen regard their lumber producing operations as a sideline business, and one admitted it was a hobby. One of the fourteen producers emphasizes marketing and sales more than production. He purchases rough-sawn lumber from approximately five timber licensees, and planes and sells it. This same company also buys or contracts to purchase finished lumber from a number of the smallest producers and markets it for them.

Of the six lumber operators who produce between four and six million board feet annually, four are solely engaged in lumber production. These four, significantly, tend to be the largest of the group. Two of the three smallest firms are engaged in other related businesses. One operation is owned by a large Edmonton based building construction contractor who provides a market for his own lumber. The other operates

a subsidiary treated-post-and-pole producing plant and a general store. From the foregoing discussion, it seems apparent that the five million foot board measure level appears to be the smallest, self-sufficient, viable size.

A number of larger lumber producers of the study area agreed with the selection of the five million level. Mr. A. J. Hamilton, recognized as one of the leading accountants in the Northern Alberta lumber industry, contended that a self-sufficient lumber producer must be producing at least five million board feet of finished lumber yearly in order to employ and pay the salaries of dependable full time, year-round skilled workers. This means that a producer must be processing not less than one million board feet of rough-sawn lumber per month at his planer mill during the five month long planing season as shown in Table I in Chapter II .

By way of conclusion, this writer would suggest that some of the smaller apparently inefficient mills could raise their annual production to the five million foot board measure level by injecting a higher labour input, or in other words, by operating the mill for a greater number of hours per day. This could be done by paying overtime to labour, or by operating on a one-and-a-half or two shift basis as do the larger plants such as North Canadian Forest Industries. The assumption is that if this large company can manage its labour on such a basis, so can a small producer.

Table X LUMBER PRODUCERS: Their Production Levels and Related and Subsidiary Business

Producer	Average Annual Production In Foot Board Measure	Number of Other (Subsidiary) Business	Description
Swanson Lumber Co.	56,000,000	Nil	-
Imperial Lumber Co.	41,931,958	1	Lumber retailing & hardware.
N. C. F. I.	30,393,259	1	Plywood production.
Western Construction	14,254,271	2	Construction Contracting Equipment Sales.
Revelstoke Lumber Co.	13,603,898	1	Lumber retailing & hardware sales.
Collins-Fischer	12,806,871	Nil	-
Federated Co-operatives	10,196,252	1	Retailing.
Hett and Sibbald	5,650,961	Nil	-
H. R. & N. Lumber	4,413,372	Nil	-
Hanson & Reynolds	4,334,614	Nil	-
Pelican Spruce Mills	4,289,579	1	Building Construction.
Bissell Brothers Lumber	4,189,078	Nil	-
McRae Lumber Co.	4,073,242	2	Post & pole production. Gen. Merchandise Store.
Smith Mills Lumber	3,556,887	1	Sawmilling equipment manufacture and sales.
Ken Mitchell Lumber	3,373,199	At least one.	Unknown.
Grant Brothers	2,803,718	3	Farm. Service Station Equipment Rentals.
Mid West Lumber	2,593,462	1	Lumber retailing & hardware sales.
Houg Construction Co.	2,274,498	At least one.	Unknown.
Buchanan Lumber	2,062,632	Nil	-
Mike Mulyk Lumber	2,030,055	1	Rough-sawn lumber contractor.
Mikkelsen Brothers Lumber	1,688,498	At least one.	Farm. Others.
O'Brien Lumber Company	1,173,701	Nil	-
James McLean Lumber	1,106,568	1	Lumber contractor.
Karpiuk Bros. Lumber	1,088,917	1	Farm.
Nelson Lumber	938,940	3	1. Retail Lumber Sales. 2. House Construction. 3. Wholesale Lumber Sales.
Zavisha Lumber	862,292	1	Service Garage.
Pura Lumber	582,645	1	Farm.

Table XI

CONTRACTORS AND PRODUCTION

Largest to Smallest Finished Lumber Producers	No. of Planer Mills	No. of Contract-tors Sawmills	No. of Own Sawmills	Approx. No. of Own Logging Shows	Approx No. of Contract Logging Shows	Average Annual Production 1960 - 1965
Swanson Lumber Co.	6	13	1	3	35	56,000,000
Imperial Lumber Co.	4 (2 Cont. (2 Own	12	1	-	20	41,931,958
N. C. F. I.	1	-	1	2	11	30,393,259
Western Construction	1	6	1	-	2	14,254,271
Revelstoke Lumber Co.	1	4	-	-	2	13,603,898
Collins - Fischer	2	5	1	-	10	12,806,871
Federated Co-op	1	4	1	-	10	10,196,252
Hett and Sibbald	2 (1 1966- moved to Enilda) from Edson)	5	-	-	5	5,650,961
H. R. & N. Lumber	1	-	1	1	4	4,413,372
Hanson & Reynolds	1	-	1	1	4	4,334,614
Pelican Spruce Mills	1	-	1	-	3	4,289,579
Bissell Bros. Lumber	1	5	1	1	5	4,189,078
McRae Lumber Co.	1	1	1	1	3	4,073,242
Smith, Harry M.	1	-	1	2	-	3,556,887
Mitchell, Ken A.	1	3	-	-	3	3,373,199
Grant Bros.	1	1	1	1	1	2,803,718
Mid West Lumber	1	3	1	1	-	2,593,462
Houg Construction	1	-	1	1	-	2,274,498
Buchanan, G.	1	3	1	-	3	2,062,632
Mikkelsen, J.	1	-	1	1	-	1,688,498
O'Brien, F. J.	1	-	2	1	-	1,173,701
Karpiuk, C.	1	-	1	1	-	1,088,917
Nelson Lumber	1	4	1	1	-	938,940
Zavisha, H.	1	-	1	1	-	862,292
Pura, G.	1	-	1	1	-	582,645

CHAPTER V

CONCLUSION

This chapter contains two parts. The first part discusses, in general terms, the nature of regions in order to shed light on the nature and type of the ascribed sawmilling regions of Northern Alberta as shown in figure 16.

The second part of the chapter will deal with some concluding remarks on the minimum economic size of forest products industries of the future.

Part 1.

Sawmilling Regions of Northern Alberta.

Before delving into the regions of sawmilling activity in Northern Alberta, a discussion on the nature of 'regions' might prove valuable. One of the foremost authorities on the nature of regions is the geographer Derwent Whittlesey. Basically Whittlesey recognizes two types of regions:

"No matter what criteria are invoked in defining them, geographic regions of all kinds may also be grouped under two heads according to whether they are uniform or nodal." 1.

Uniform regions are so throughout. The uniformity is not usually complete, for there is always a certain range of characteristics permitted by the criteria and there are irrelevant differences which are disregarded. But within the limits set by the criteria, regions of this kind are uniform.

---

1. Derwent Whittlesey, "The Regional Concept and the Regional Method", in American Geography: Inventory and Prospect. Preston E. James & Clarence F. Jones. Editors. Published for the Assoc. of American Geographers by Syracuse Univ. Press. 1954, Syracuse. Page 37.

Nodal regions are homogeneous with respect to internal structure or organization. This structure includes a focus, or focii and a surrounding area tied to the focus by lines of circulation. Nodal regions of like character may lie adjacent to each other or one such region may be surrounded by nodal regions of different character. A nodal region may coincide with other nodal regions of different character, selected by the application of different criteria. Internally nodal regions are marked by a diversity of function that goes far beyond range of minor variation permitted in uniform regions. Circulation, including the movement of people and goods, communications, and other aspects of movement, is a primary attribute. "Hence the nodal region is bounded by the disappearance or the differential weakening of the tie to its own focus in favor of some other focus. Its boundary lines tend to run at right angles to the lines that tie it together."[2]

Whittlesey pursues the regional discussion by suggesting that several characteristics pertain to both uniform and nodal regions. Hence <u>every kind of region</u> differentiated may properly be checked against these items. Of particular relevance to the discussion of the forest products industries of Northern Alberta, are the first and sixth characteristics for <u>all</u> regions:

> A1 .The region is unique, in that it differs in location from all other regions of the same category.
>
> A6 . The region occupies a fixed position in a hierarchy of regions of the same category, in which those of each successively higher rank consist of aggregations of regions of the next lower rank..... (nodal regions based on planer mills are at the bottom of the hierarchy)* Conversely, a given region may be one subdivision of a region of higher rank. Regions that form subdivisions of another region are, of course, smaller than the latter, but otherwise the ranks have no connotation of size.[3]

---

2. Derwent Whittlesey, Op. Cit. Page 38.
* My brackets.
3. Derwent Whittlesey, Op. Cit. Page 38-39

While Whittlesey describes two characteristic attributes for uniform regions, he outlines four characteristic attributes for nodal regions. Two of these atributes are of particular relevance to this study:

> C1. The nodal region is homogeneous because the whole of its area coincides with an integrated design of internal circulation. This unity of organization, and not the spread of specific features throughout its whole area (as is the case of the uniform region)* differentiates it from other regions.
>
> C2. The nodal region contains a focus (occasionally more than one) that serves as a node of organization. The focus is likely to be a center of communication and is most often urban. It may lie outside the region in exceptional cases, but it must be closely connected with the region by one or more lines of communication;.... The same place may serve as the focus of two or more nodal regions.[4]

Keeping in mind the preceding remarks, nodal regions of sawmilling activity in Northern Alberta can be discerned on the basis of two factors:

1. They are areas in which raw material moves from forest to planer mill.
2. They are areas where planer mills are grouped or clustered around certain points on the railway transport net. In other words, the eight areas delimited in Figure 16 are regions insofar as the fact that the raw material in each region flows toward a separate segment of the transportation system. (See Figures 6 to 10, and Appendix D,E, and F.) These separate segments can in fact be described as nodes.

---

* My brackets.

4. Derwent Whittlesey, Op. Cit. Pages 40-41.

Regions of Sawmilling Activity In Northern Alberta

Using Whittlesey as a framework, an analysis of Northern Alberta's forest products industry was undertaken with a view to identifying regions. In the concluding remarks of Chapter III, it was observed that planer mills appeared to be focii of sawmilling activity and therefore, focii of a functional nodal region.

These focii were usually not located in one place. They have, however, been regarded as functionally central insofar as they are located alongside specific segments of the transportation net in the study area.

The results of this analysis revealed eight regions of sawmilling activity in Northern Alberta(see Figure 16):

1. the Smoky River drainage basin.
2. the northern Swan Hills and Lesser Slave Lake region.
3. the southern Swan Hills.
4. the Calling Lake region.
5. the Lac La Biche region.
6. the Clear Hills-Naylor Hills region.
7. the Hay River region.
8. the Lake Athabasca region.

At this point, the average annual lumber production figures for each region during the years 1960 to 1965 provide some quite interesting data:

Table XII Average Annual Finished Lumber Production Per Region 1960 - 1965

Region Number & Name		Production/F.B.M.
1	Smoky River Region	53,764,669
2	N. Swan Hills-Lesser Slave Region	60,875,151
3	S. Swan Hills Region	47,761,303
4	Calling Lake Region	9,279,987
5	Lac La Biche Region	6,047,857
6	Clear Hills-Naylor Hills Region	32,311,868
7	Hay River Region	17,500,000
8	Lake Athabasca Region	12,000,000

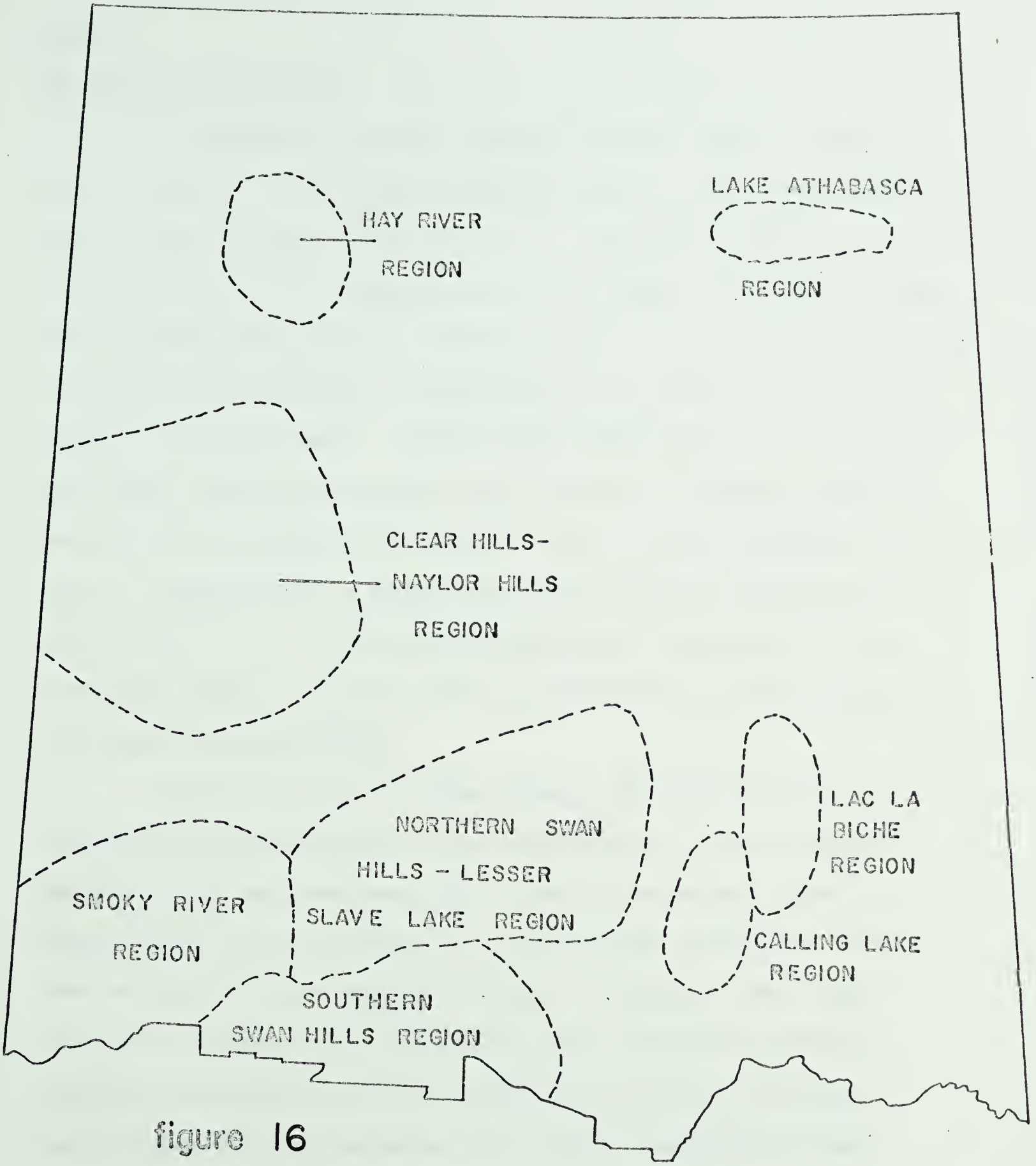


figure 16

SAWMILLING REGIONS OF NORTHERN ALBERTA (1960-1965)

SCALE

50 25 0 miles 50 100 150

R.B.M.

Part 2.

The Future Economic Size.

In general, the lumber industry has been slow to change.[5] Future changes in this Northern Alberta industry will be dramatically rapid if pulp and paper mills are built. A large pulp mill is to be built at Whitecourt by MacMillan, Bloedel and Powell River Limited before 1968. Another pulp mill will likely be built in the Grande Prairie area in the near future pending the completion of the Alberta Resources Railway to Grande Prairie. Assuming that these pulp mills will purchase wood chips from the surrounding lumber producers, an almost immediate revolution in the minimum economic size level in lumber production will occur. Geographically, a widespread movement towards centralized sawmilling will occur. In other words, the boundary of the second order sawmilling region of interior British Columbia will be moved eastward to include Northern Alberta.

The future of the lumber industry of Northern Alberta is therefore directly dependent on the establishment of pulp and paper mills that will purchase wood chips. The minimum economic size of a single forest products producer will range between fifteen and twenty-five million foot board measure annually. In general, these larger units will resemble the North Canadian Forest Industries sawmilling operation at Grande Prairie. (see Appendix A). Most of the present small producers will be absorbed by the larger, economically viable producers (i.e. above five million board feet annually) who are at the present time able to pay the initial cost of debarking and chipping machinery.

---

5. Personal Communication. Mr. S. A. Robinson, A. F. P. A. Edmonton, 1966.

It is quite feasible that the future number of lumber producers will be sufficiently reduced through the processes of amalgamation and absorption, that there will eventually be the same number of producers as there are regions, as shown in Figure 16. There will likely be room for two large producers in the first three regions, where currently extracted timber volumes are large. As well, if a twenty-five mile hard-surface or all-weather road was built connecting regions four and five, they could be considered as single region.

BAND RESAW - As illustrated in Plate XIX, this type of saw is merely a large band saw. Because of its narrower blade, it is used at the planer mill to "resaw" two-inch thick planks into 7/8-inch to one-inch thick boards.

CRUISING CHARGES-Fees levied by the Province upon quota holders in payment for having a timber inventory taken of their lease areas

FOOT BOARD MEASURE OR F.B.M. - One foot board measure and one board foot are synonymous. One foot board measure is a piece of wood measuring twelve inches by twelve inches and one inch thick.

GANG SAWS - This is a set of either circular saws or saw blades as shown in Plate XIII that are grouped together, side-by-side, in a "gang". That is, they constitute a "gang" of saws that are spaced in such a way that when a log or large cant is swept through the gang, it emerges as a series of boards, planks or cants of the desired width.

KERF - This word refers to the width of the saw cut. This width is determined by the thickness of the saw teeth attached to a circular saw or by the width of the steel band that comprises the band saw blade.

LOG CONVERSION PLANT - This term refers to a sawmill or a sawmill and planer mill combination whether spatially integrated or not. However, a planer mill plant alone cannot be considered as a log conversion plant.

LOGGING SHOW SITE - This phrase refers strictly to that area where the trees are cut down and does not include the sawmill. The trees, the tree fellers, the accompanying delimbers or swampers, and the skidders, skidder operators and helpers are together considered as the logging show.

LOW BOY - This term refers to a flat-decked type of trailer hauled behind a short-wheeled base type of truck often referred to as a tractor. See Plate XVI.

SAWYER - This is the person who operates the log carriage. The log is gripped in a log carriage as shown in Plate XII and the sawyer guides the log as it is swept through the saw which is usually the traditional head-rig saw as shown in Plates X, XI and XII.

SKIDDING - This is the act of dragging logs by one end, behind a skidding machine whether it is a skidding tractor as shown in Plate I and IV or an arch truck as shown in Plate V.

STUDS - Studs are the common "two-by-fours" used in frame house construction. The precision end-trimmed studs are usually eight feet long, the length most commonly required in construction.

STUMPAGE FEES - This term refers to a set of fees or payments that are levied by the Provincial Government upon all persons cutting timber in Alberta Forest Divisions; that is lands that have been closed to settlement. When timber is set-up for sale by the Provincial Government, all interested persons take part in a public auction or closed bidding session. The highest bidder takes the timber. The price he pays is the stumpage fee. Payments are made to the Provincial Government on a thousand foot board measure basis.

TIMBER BERTHS - A timber berth was a plot of forested land which was leased from the Provincial Government for a set period of time by a licensee who, for that period of time, held the cutting rights on the plot. The timber berth was replaced by the timber quota in May, 1966, with the introduction of the quota system of timber disposal.

TRIM SAWS - Trim saws are used at the sawmill and also at the planer mill. Its function is to trim, with some degree of accuracy, planks, boards and cants to the exact desired length.

BIBLIOGRAPHY

"Alberta Cracks Down On Timber Rules", Financial Post. 58:15 (Sept. 26, 1964).

Alberta Forest Inventory. Alberta Dept. of Lands and Forests. Forest Surveys Branch. November 1961. Edmonton.

Bell, G. E. "Wood Utilization Practices and Trends". The Forestry Chronicle XXXIII, 1957. P. 97.

Blyth, A. W. Seeding and Planting of Spruce on Cut-Over Lands of the Sub-alpine Region of Alberta. Forest Research Division, Canada. Dept. of Forestry. Technical Note #2. Ottawa. 1955.

Brown, R. J. E. Permafrost Investigation On The Mackenzie Highway In Northern Alberta and Mackenzie District, N.W.T. National Research Council. Technical Paper 175, Ottawa. 1964.

Cameron, D. R. Report on Timber Conditions Around Lesser Slave Lake. Forestry Branch Bulletin No. 29, Dept. of Interior. Ottawa. 1912.

Carter, R. T. "A Stable Woods Labour Force", The Forestry Chronicle, XXXI (March, 1955) P. 23 to 30.

Clark, J. D. Cutting Practices In Western Spruce Forests. The Forestry Chronicle. Vol. 36. June 1960. P. 146.

Cormack, R. Spruce-Fir Climax Vegetation in Western Alberta. The Forestry Chronicle. XXXII, P. 311-345. 1956.

Davis, John, et al. The Outlook for the Canadian Forest Industries. (Royal Commission on Canada's Economic Prospects Series). Ottawa: The Queen's Printer, 1957.

Doyle, J. A. "Small Logs and the Production of Spruce Lumber". Timber of Canada. April, 1960.

Duffy, P. J. B. A Forest Land Classification for the Mixed-wood Section of Alberta. Forest Research Branch, Bulletin No. 1128. Canada Dept. of Forestry. Ottawa. 1965.

Godwin, Gordon. "The Impact of Modern Technology on Forestry in Canada." The Forestry Chronicle, Vol. 39, December 1963. P. 446-455.

Hardwick, Walter G. Geography of the Forest Industry of Coastal British Columbia. (Occasional Papers in Geography, No. 5, Canadian Association of Geographers). Vancouver: The University of British Columbia Press, 1963.

Hamilton, A. J. "Future Sawmill Development in Northern Alberta", Changing Frontier Conference, at Peace River. Northern Alberta Development Council, Edmonton, 1965.

"Infant Grows Muscles", Western Business and Industry. 37:49-50. (September 1963).

Lees, J. C. Partial Cutting Scarification In Alberta Spruce-Aspen Stands. Forest Research Branch Bulletin No. 1001. Canada Dept. of Forestry. Ottawa 1963. P. 14-15.

Lees, J. C. "A Test of Harvest Cutting Methods in Alberta's Aspen-Spruce Forest". Forest Research Branch, Bulletin No. 1042. Canada Dept. of Forestry. Ottawa 1964.

Loomis, R. D. "Forest Surveys in Alberta". The Forestry Chronicle, XXXII, 1956, P. 172.

Loomis, R. D. "Conflicts In The Use of Land in Alberta". The Forestry Chronicle. Vol. 39 (March 1963) P. 31.

Love, D. V. "The Forestry Situation in Canada". The Forestry Chronicle XXXV, 1959. P. 187-191.

Love, D. V. "The Future of Trade and Investment in Forest Products Between the United States and Canada". The Forestry Chronicle. Vol. 38, March 1962. P. 49-55.

Lower, A. R. M. The North American Assault on the Canadian Forests. Toronto: The Rycrson Press, 1938.

MacLeod, W. K. & Blyth, A. W. "Yield of Even-Aged Fully Stocked Spruce-Poplar Stands in Northern Alberta". Forest Research Branch Technical Note. No. 18, Canada Dept. of Forestry. Ottawa 1955.

McNeil, G. "Alberta Lumber Camps Primitive". Canadian Labour, 9:28 (June, 1964).

Moss, E. H. Collected Papers on the Vegetation of North-western Alberta. National Research Council, Ottawa 1952 - 53. 48 pages.

Myles, Eugenie L. The Emperor of Peace River. The Institute of Applied Arts. Edmonton. 1965.

Odynsky, W., Wynnyk, A., and Newton, J. D. Soil Survey of the High Prairie and McLennan Sheets. Report No. 17. Alberta Soil Survey. Research Council of Alberta. Edmonton. 1952.

Odynsky, W., Wynnyk, A., and Newton, J.D. Soil Survey of the Grande Prairie and Sturgeon Lake Sheets. Report No. 18. Alberta Soil Survey. Research Council of Alberta. Edmonton. 1956.

"Peace River Country May Set $60 Million Forest Complex". Financial Post. 58:37 (February 8, 1964).

Pearse, P. H. "Distortions In The Market For Forest Land", The Forestry Chronicle. Vol. 41. 1965. P. 406-418.

Saskatchewan. Saskatchewan's Forests , Department of Natural Resources, Regina: The Queen's Printer. 1955.

Saskatchewan. Forest Resources of the Pasquia-Porcupine Area , Department of Natural Resources, Regina: The Queen's Printer. 1952.

Saskatchewan. Forest Resources of the Prince Albert Area of Saskatchewan, Department of Natural Resources, Regina: The Queen's Printer. 1953.

Saskatchewan. Forest Resources of the Meadow Lake Area of Saskatchewan , Department of Natural Resources, Regina: The Queen's Printer. 1954

Saskatchewan. Forest Resources of the Cumberland Lake-Flin Flon Area of Saskatchewan, Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer. 1955.

Saskatchewan. Forest Resources of the Buffalo Narrows-Beauval Area of Saskatchewan, Department of Natural Resources, Forestry Branch, Regina: The Queen's Printer. 1956.

Scheult, L. R. "Rail, Truck or Water", Timber of Canada, 24:28-32, 34. (February, 1963.)

The Quota System of Timber Disposal. Alberta Dept. of Lands and Forests. April, 1965. Edmonton.

Wright, T. G. "The Canadian Spruce Forest", The Forestry Chronicle, XXXV. 1959. P. 291-296

APPENDIX A

North Canadian Forest Industries of Grande Prairie, a subsidiary of Canadian Forest Products Limited of Vancouver, is Northern Alberta's most fully integrated and most centralized lumber and plywood producer. method of production is quite different from the small fragmented lumber producing system typical of Northern Alberta.

As was pointed out in Chapter V, it is the contention of this writer that the lumber producers of Northern Alberta will, in future, be centralizing their sawmilling systems in order to use wood chippers. A discussion of the North Canadian Forest Industries sawmill will serve to illustrate what in fact may be commonplace in Northern Alberta in ten years.

In May, 1966, this company opened a new one million dollar sawmill, debarker and pulp chip plant that represents a significant advance towards fuller utilization of the Northern Alberta forest resources. The mill is designed to convert into pulp chips all slabs and edgings which were formerly wasted in the manufacture of lumber. Slabs and edgings now comprise about thirty per cent of the sawlog.

One way to illustrate the significance of the advance in additional wood recovery is to consider how the salvage of wood, formerly wasted, extends the forest resources. The new sawmill is capable of cutting forty million board feet of lumber per year on a two shift basis. Along with the lumber production, the new pulp chip recovery facilities permit the production of an additional 2,200,000 cubic feet of pulp chips. This is a recovery from sawmilling waste of approximately thirteen thousand tons of bleached sulphate pulp. "It is

interesting to note also that it represents annual growth from about seventy thousand acres of typical Northern Alberta forest land."[1]

Centralization and the Pulp Chipper

While the manufacture of plywood is North Canadian's main activity in Grande Prairie, lumber is an important subsidiary product of this functionally integrated log conversion plant. Up until 1965 - 1966, the sawlog portion of the tree was processed in nearly a dozen semi-portable bush sawmills operated only in the winter months. Now, the entire tree, in lengths up to forty feet (see Plate VI), will be hauled into Grande Prairie from as far as ninety-five miles away, one of the longest overland log hauls in North America.[2] Forty per cent of North Canadian's logs go to the plywood plant as peeler logs. This is apparently a very high percentage compared to some of Sweden's integrated plywood lumber mills.[3] North Canadian's major problem in this respect is a shortage of logs. The firm would increase its lumber production and lessen the proportion of logs diverted to the plywood plant if it were able to procure a larger log supply. However, the short one hundred day harvest season, which is not experienced in British Columbia and parts of Sweden, does not provide enough time to make this possible.

North Canadian Forest Industries has two logging camps that harvest one-third of their total log supply. Almost all of the remaining two-thirds is provided by thirteen logging contractors. Most of

---

1. Canfor Newsletter. Vol. 3, No. 6, July 1966, Vancouver. Page 1.
2. Personal Communication. Mr. G. A. Patterson, General Manager, N.F.C.I.
3. Personal Communication. Mr. G. A. Patterson.

North Canadian's logs come from two large leased harvesting areas shown in Figure 5. A very small portion of the mill's log supply is purchased on the open market from farmers and other lumber producers.

Once the logs are in the sorting yard at Grande Prairie, the best logs are diverted to the plywood mill which is over one-half a mile away. The remaining logs are converted into lumber and pulp chips. Manufacture of pulp chips from the sawmill waste made it necessary to centralize sawmilling in Grande Prairie. Since the installation of debarking and chipping facilities require a mjaor investment of well over one-quarter of a million dollars, it is not feasible to purchase more than one set of this equipment. North Canadian's sawmill can, in effect, be described as a second order sawmill system location in a first order sawmilling region.

Unique Sawmill

The new sawmill is specially designed for utilization of small logs, namely, the tree-top leftovers from peeler logs. These small logs are processed at the rapid rate of one hundred and thirty-two feet per minute into a uniform product: precision-end-trimmed studs, commonly referred to as two by fours. The capacity of the sawmill is seventy-five thousand board feet of lumber per shift together with approximately one hundred tons of pulp chips per shift.

The sawmill is of advanced design, similar to the automated sawmills described in Chapter IV. It is driven by electric power and hence requires an equivalent of seventeen hundred horse power. The circular sawblades are not the newly developed "chip and saw" blade now being used by some of the sawmills of interior British Columbia. With this type of sawblade useable, "saw-chips" are the result of the cut

instead of waste sawdust. In other words, instead of sawing through the log, this new blade "chips" its way through the log, thus raising log utilization levels another ten per cent. Despite the high degree of automation in the new mill, North Canadian's former payroll of two hundred and sixty-five men was raised to two hundred and eighty.

The unique feature of the new plant is its log bucking and sorting facilities. Over 5,000 logs per shift must be handled by the system in which peelers are sorted by species and the remaining sawlogs debarked and bucked (sawn) to the correct length. The Swedish made log debarker is designed to provide a debarking capacity of one hundred and twenty lineal feet per minute for frozen logs. The debarker is necessary because bark fragments are an unwanted impurity in a load of pulp chips.

Chips to Prince George

Pulp chips are shipped to Prince George Pulp and Paper Limited at Prince George, British Columbia, in huge specially designed rail cars over the N.A.R. to Dawson Creek and then the Pacific Great Eastern Railway to Prince George. The rail cars are fifty-two feet long and have a capacity of six thousand four hundred cubic feet or seventy-five tons. (See Plate XXIV). When fully loaded, the cars weigh one hundred tons. At Prince George, the chips fetch $11.50 per bone dry unit which is a weight of 2,400 pounds. Though the chips are shipped while still wet, a conversion formula is used to work out the equivalent bone dry weight. Approximately sixty-two bone dry units are shipped in each car, thus each carload of chips fetches a price of approximately seven hundred and thirteen dollars. The money is being used to amortize the cost of the debarking and chipping machinery over a five-year period.

A seventy-five ton load can only be achieved by a high pressure blowing system which compresses the chips tightly in the car during loading. The car is unloaded at the pulp mill by tipping it upward and forward to allow the chips to pour out the end of the car through a hinged gate. The tipping platform shakes the whole car to loosen the chips and permit them to flow out freely.

In conclusion, it can be seen from the foregoing discussion that the most important trend in the lumber industry of the study area is toward greater utilization of the log in order to defray the extra costs incurred through the increasing use of large scale machinery. In future, this trend will separate the survivors and non-survivors in an increasingly competitive industry.

APPENDIX B

There are three plywood producing mills in the study area: North Canadian Forest Industries Ltd. at Grande Prairie; Weldwood of Canada, Ltd., and Zeidler Plywood Corporation, at Edmonton. North Canadian Forest Industries, Ltd., a division of a Vancouver based parent company, Canadian Forest Products Ltd., produces both lumber and plywood. Plywood manufacture is the main interest of this large, functionally centralized operation. Weldwood of Canada is a subsidiary of U. S. Plywood and Zeidler Plywood, the property of an Edmonton industrialist. North Canadian's mill produces approximately six times as much plywood as either the Weldwood or Zeidler mills.[1]

A basic difference between plywood production and lumber production is found in the labour, capital equipment and building requirements. The plywood mills in the study area for example, must use a considerable amount of bulky, heavy and costly equipment, a large building, plus a great deal of labour (skilled and semi-skilled) in order to manufacture the end product. The three producers operate their plants for either two shifts or three shifts per day in order to gain maximum from their large capital investment.

The complete plywood plant must be constructed on a permanent location. Logs must be shipped, in unconverted form, using logging trucks and railroads in Northern Alberta's case, to the plywood plants. The shipping of whole logs is costly and is one of the major factors contributing to the high cost of finished plywood.

Zeidler Plywood Corporation and Weldwood of Canada obtain

---

1. Pers. Comm., Mr. G. A. Patterson, N.F.C.I., Grande Prairie.

their logs from cutting areas found along the south shore of Lesser Slave Lake as well as along the Athabasca River, north of Fort McMurray. Both producers employ contractors who log the quota area (formerly, timber berth) and skid to landings. The hauling of logs from the landing to railway sidings is also carried out under contract. Weldwood, for example, has its contractors haul logs to eight different Northern Alberta Railways sidings found along the south shore of Lesser Slave Lake. (See Plates XXV and XXVI). During the winter of 1965 - 1966, Weldwood used five contractors and fifteen sub-contractors for its logging operation. This company has found this method to be inefficient and unsatisfactory and was planning to do its own logging during the 1966 - 1967 winter. Zeidler, however, planned to continue using contractors.

Weldwood has contracted with three log hauling firms to haul logs at the rate of $4.00 per thousand board feet for the first eight miles and $0.25 per thousand per mile for the next thirty miles. The rate then drops to $0.15 per thousand per mile up to one hundred miles. Sixty miles is regarded as the greatest distance which logs can be hauled economically by truck at the present time.

As was mentioned in Chapter II, these logs are usually stored at railway sidings until they are needed. As these logs are not paid for until they are moved from the siding, the large sums of capital that would otherwise be tied up in logs stored at the railside, can be diverted to more active uses. The benefit gained as a result of storing logs in this manner is illustrated in the following table showing a breakdown of logging and hauling costs.

BREAKDOWN OF COSTS[2]

Average stumpage fee per thousand board feet (spruce)		$ 6.85
The cost of loading logs onto railway cars per thousand board feet		$ 2.00
Shipping by rail: cost per thousand board feet		$ 12.00
		$ 21.00
Costs that must be paid immediately:		
Logging contractors charges per 1000 f.b.m.	$ 22.00 -	$ 25.00
Trucking contractors rates per 100 f.b.m.	$ 4.00 -	$ 7.00
	$ 26.00 -	$ 32.00

When the plywood plant requires more logs, the stumpage fees are paid, and the logs are loaded and shipped in roofless railway gondola cars via the N.A.R. mainline to Edmonton. From the N.A.R. marshalling yards at Dunvegan Yards, Weldwood's logs are transferred east to the C.N.R. Calder Yards and then moved west again to the Weldwood Plant at 156 Street and 129 Avenue. Zeidler's logs must be moved from Dunvegan Yards to Calder Yards then into the C.N.R. City yard. From here a "city transfer" is accomplished where the logs are moved to the C.P.R. north side yards via the C.P.R. interchange at 112 Street and 104 Avenue. Finally the logs are moved across the High Level Bridge to the Zeidler Plywood Corporation plant at the south end of the C.P.R. south side yards. Each of these "transfers" costs approximately four dollars per railway car.

---

2. Personal Communication. Jack Ostergaard. Weldwood of Canada, 1966.

Weldwood of Canada claimed that it costs an average of $125.00 to ship from their eight railsidings to their plant.[3] By the same token it then costs Zeidler $129.00. Included in these shipment charges are the $4.00 (Weldwood) and $8.00 (Zeidler) transfer costs that would be unnecessary if the two plants were located along the N.A.R. line.

Weldwood of Canada estimated that it costs them approximately $50.00 to cut down and transport to the Edmonton mill an average fourteen inch by eight foot spruce log.[4] At Weldwood's Quesnel, B. C. mill, the same costs amount to an average of $28.00. Weldwood estimates that transportation costs amount to 50% of total production costs.

Total over-all transportation costs would be higher were it not for a special type of in-transit milling rate that is given Weldwood and Zeidler. To obtain the special rate the two producers must ship 90 - 92 per cent of their finished plywood to market via the same railroad as shipped their logs.

Plywood producers have an advantage over lumber producers: they can use more of the log. Weldwood claims that it uses 70 - 75 per cent of the log while most lumber producers use 50 per cent. The extra 20 - 25 per cent helps to defray the higher transport costs. The left over core, which looks similar to a fencepost, four inches in diameter and eight feet long is sold to the Hinton pulp mill or burned.

Weldwood and Zeidler manufacture a great deal of poplar plywood. It consists of spruce "inners" as the inside material and popular veneer as the exterior material. Poplar can be obtained at a low stumage

---

3. Personal Communication. Jack Ostergaard. Weldwood of Canada. 1966.

4. Personal Communication, Jack Ostergaard. Weldwood of Canada. 1966.

rate of approximately $0.25 per thousand board feet, while white spruce costs an average of $6.85 per thousand board feet stumpage fee. The very low cost of purchasing poplar logs may be the reason why these two small plants can successfully compete with the larger plywood producers. Admittedly, poplar plywood is not as versatile as spruce plywood, but there is still a great demand for it because it is cheaper.

North Canadian Forest Industries manufactures spruce plywood. Approximately twelve million board feet, or forty per cent of N.F.C.I.'s annual thirty-two million board foot annual cut is diverted to plywood. The General Manager of N.F.C.I. claimed that this was too high a percentage. Many of the highly integrated centralized Swedish forest products industries use only ten per cent of their total annual cut but still produce twelve million foot board measure of plywood. In other words, these Swedish mills are harvesting four times as much timber as North Canadian. When such a mill diverts the best ten per cent of its logs to the peeler blades, it can be seen that there exists a greater probability that a better grade of log will be used.

As was pointed out in Appendix A, North Canadian's sawmill-planer mill plant has been re-designed to permit fuller utilization of the log. The plywood mill is also designed to waste as little as possible. The left over bark peelings are stockpiled in a huge "hog fuel" pile and used as fuel to provide steam-electric power to help operate the plywood plant.

APPENDIX C

Average Annual Finished Lumber Production by Firm per Planer Mill

Name of Firm	Planer Mill Locations(s)	Average Annual Production in Foot Board Measure 1960-65
Swanson Lumber Co.	# 2 High Level*	17,500,000
	#22 Chisholm Mills	13,500,000
	# 1 Fort Chipewyan	12,000,000
	#30 Whitecourt	8,500,000
	# 3 Keg River	4,500,000
		56,000,000
Imperial Lumber Co.	#13 Grande Prairie	17,000,000
	#20 Kinuso	17,900,000
	#23 Wandering River	4,000,000
	#32 Fort Assiniboine	3,000,000
		41,900,000
North Canadian Forest Industries	#12 Grande Prairie	30,400,000
Western Construction	#29 Whitecourt	14,254,271
Revelstoke Lumber Co.	#31 Whitecourt	13,603,898
Collins-Fischer	# 4 Hotchkiss	10,000,000
	# 9 Grimshaw	2,800,000
		12,800,000
Federated Cooperatives	#21 Smith	10,000,000
Hett and Sibbald	#17 Enilda	5,650,000
H.R. & N.	#10 Fairview	4,413,372
Hanson and Reynolds	#11 Dimsdale	4,334,614
Pelican Spruce Mills	#24 Amesbury	4,289,579
Bissel Brothers Lumber	#16 Enilda	4,189,078
McRae Lumber Co.	#19 Faust	4,073,242
Smith Mills Lumber	# 6 Smith Mills	3,556,887
Ken Mitchell Lumber	# 5 Manning	3,373,199
Grant Brothers	# 8 Hines Creek	2,803,718
Mid-West Lumber	#36 Edmonton	2,593,462

* These numbers correspond to the numbers in Appendix D

Name of Firm	Planer Mill Location(s)	Average Annual Production in Foot Board Measure 1960-65
Houg Construction Company	#18 Joussard	2,274,498
Buchanan Lumber	#14 High Prairie	2,062,632
Mike Mulyk Lumber	#28 Fox Creek	2,030,055
Mikkelsen Brothers Lumber	#25 Athabasca	1,688,498
Wallach's Planing Mills	#25 Athabasca	1,267,265
O'Brien Lumber Co.	#15 High Prairie	1,173,701
James McLean Lumber	#27 Little Smoky	1,106,568
Karpiuk Brothers	#35 Waskateneau	1,088,917
Nelson Lumber	#37 Edmonton (their own) (contractors)	938,940 4,000,000 4,938,940
Zavisha Lumber	# 8 Hines Creek	862,292
Charles H. Fluet	#33 Meadowview	703,104
Pura Lumber	#34 Thorhild	582,645

APPENDIX D

Location of Planer Mills

Number	Location of Dot	Firm
1	Fort Chipewyan	Swanson Lumber
2	High Level	Swanson Lumber
3	Keg River	Swanson Lumber
4	Hotchkiss	Collins-Fischer
5	Manning	Ken Mitchell Lumber
6	Smith Mills	Smith Mills Lumber
7	Hines Creek	Zavisha Lumber
8	Hines Creek	Grant Brothers Lumber
9	Grimshaw	Collins-Fischer
10	Fairview	H.R. & N. Lumber
11	Dimsdale	Hanson and Reynolds
12	Grande Prairie	North Canadian Forest Industries
13	Grande Prairie	Imperial Lumber Co.
14	High Prairie	Buchanan Lumber
15	High Prairie	O'Brien Lumber
16	Enilda	Bissel Brothers
17	Enilda	Hett and Sibbald
18	Joussard	Houg Construction
19	Faust	McRae Lumber
20	Kinuso	Imperial Lumber Co.
21	Smith	Federated Cooperatives
22	Chisholm Mills	Swanson Lumber
23	Wandering River	Imperial Lumber
24	Amesbury	Pelican Spruce Mills
25	Athabasca	Mikkelsen Brothers
26	Athabasca	Wallach's Planing Mills

Number	Location of Dot	Firm
27	Little Smoky	James McLean Lumber
28	Fox Creek	Mike Mulyk Lumber
29	Whitecourt	Western Construction
30	Whitecourt	Swanson Lumber
31	Whitecourt	Revelstoke Lumber
32	Fort Assiniboine	Imperial Lumber
33	Meadowview	Charles Fluet
34	Thorhild	George Pura Lumber
35	Waskateneau	Charles Karpiuk
36	Edmonton	Mid-West Lumber
37	Edmonton	Nelson Lumber

APPENDIX E

As can be seen in figure 2, the forested area of the Province of Alberta is divided into Forest Divisions. The Forest Divisions are in turn subdivided into Forest Management Units which are numbered. A small scale map has been drawn up by the Provincial Department of Lands and Forests for each Forest Management Unit (scale: approximately 1:63,360). During the period 1960 to 1965 the Forest Administration Branch of the Alberta Department of Lands and Forests mapped the location of every leased cutting area or timber berth. It is from these maps that this writer obtained the location of logging shows as shown in figure 9. However, what is actually being shown by each dot is one leasing area. For purposes of cartographic simplification though, each lease area was called a logging show. The actual location of each logging show (or lease area) was obtained by tracing the Forest Management Unit maps with the kind permission of the Forest Administration Branch of the Department of Lands and Forests. These traced maps formed the base map for figure 9. The distinction between logging shows with sawmills and logging shows without sawmills was accomplished as a result of research during 1966.

The reader will notice that some of the logging shows as shown in figure 9 are not accounted for in figure 11. This was a result of the fact that a number of lumber producers went out of business during this period. Hence information regarding the locations of their planermills was not available.